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MASSACHUSETTS MEDICAL SOCIETY
Section of Pediatrics

Presiding: Dr. J. Herbert Young, Newton and Boston, chairman; Dr. James M. Baty, Belmont and Boston, secretary.

THE CHAIRMAN: The first paper on our program this morning is "Indications for the Use of Ammonium Mandelate in Pyuria in Children," by Dr. Warren E. Wheeler.

INDICATIONS FOR THE USE OF AMMONIUM MANDELATE IN PYURIA IN CHILDREN

WARREN E. WHEELER, M.D.*

BOSTON

DURING the past two years, a new and powerful urinary antiseptic, mandelic acid, has become the medication of choice in the treatment of bacillary infections of the urinary tract. With the aid of a few diagnostic procedures, it is possible to determine reliably the bacteriologic, functional and anatomic state of the infected urinary tract. It is the purpose of this communication to show how, with the aid of these diagnostic procedures, urinary tract infections can be treated with mandelic acid more efficiently; to sound a warning of the disappointments and dangers of its indiscriminate use; and to give briefly the results of this form of treatment in 40 patients.

MODE OF ACTION

The exact mechanism by which urinary antiseptics abolish infection in the tissues is not fully understood. It seems certain that the prompt eradication of parenchymal infection cannot be attributed entirely to the killing power of the mildly antiseptic urine exerted on the infecting organisms. However, the constant washing of the surface of the urinary tract with urine that prevents the rapid growth of bacteria will promptly bring about a sterilization of the urine stream and prevent surface reinfection from it. The chemical conditions necessary for the killing of microorganisms with mandelic acid cannot be attained within the blood or tissues, and further killing of the deep-seated bacteria must be done by phagocytosis or other natural defense mechanisms of the body. This process takes an appreciably longer time than that usually required to sterilize the urine.

Rosenheim[1] showed that the antiseptic power of mandelic acid in the urine depends on two factors: (1) the concentration of the drug, and (2) a high degree of acidity. The optimum concentration lies between 0.5 per cent and 1.0 per cent; under this condition, satisfactory bactericidal action appears only when the acidity of the urine is increased to at least a pH of 5.6.

If the kidneys do not have a fairly normal degree of function, however, bactericidal urine may not be excreted. The ability to concentrate urine and to excrete a highly acid urine are functions of the kidney which may be impaired as the result of prolonged infection, or because of changes in the kidneys due to congenital anomalies in the urinary tract. In dealing with mild degrees of renal dysfunction of this type, it may be possible by increasing the dose of mandelate, or by giving additional acid-producing salts such as ammonium chloride, to secure an effectively bactericidal urine. It is obvious, however, that overmedication with acid-producing substances which the kidneys cannot excrete invites serious consequences.

Unilateral renal insufficiency occurs quite frequently in children with urinary tract infections, usually those with anatomic defects of the kidneys or ureters, the dysfunction being due in part to obstruction to free flow of urine, and in part to the result of heavy infection which occurs in such portions of the kidney. The unaffected or less affected kidney does more than its share in excreting the bactericidal principles, whereas the side most in need of these may excrete little more than water.

Fortunately, the organisms responsible for the

Read at the annual meeting of the Massachusetts Medical Society, Section of Pediatrics, Boston, June 3, 1937.

From the Infants' and Children's hospitals, and the Department of Pediatrics, Harvard Medical School.

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majority of urinary infections in children respond to mandelate therapy. From the work of Helmholz[4] we know that the various organisms commonly encountered in these infections differ in their response to mandelic acid. Thus *Escherichia coli,* and some of the paratyphoid and dysentery-like organisms, are easily killed. On the other hand, organisms such as the *Aerobacter aerogenes,* staphylococci, streptococci and, by reason of its great tendency to produce an alkaline urine, *Bacillus proteus,* are often not inhibited sufficiently for them to be readily eradicated.

Each of the foregoing theoretical points has practical application in the treatment of patients with pyuria. An accurate conception of the actual status of the infected urinary tract is essential to the intelligent management of the individual patient, and we shall dwell briefly on the technic of investigation.

TECHNIC OF URINARY TRACT INVESTIGATION

In the first place, patients with acute or recurrent pyelonephritis are usually encountered by the physician in the febrile stage. It is well to treat the patient in this stage as a sick individual and to defer investigative procedures until after the temperature has fallen, since urinary antiseptics of the mandelic acid type, from the nature of their action, are primarily useful in attacking the residual infection after the febrile stage.

The presence of pus cells and bacteria in the urine obtained by catheter must be regarded as essential to the correct diagnosis of urinary tract infection, especially in patients known to have had symptoms of pyuria over a long period of time. A culture of the catheterized urine and the identification of the infecting organism are quite as important as demonstrating that the pyuria is not due to contamination of the urine with pus cells originating in the vulva or vagina.

Having determined the type of infecting organism, the next step should be to estimate the renal function. In our hospital practice, the phenolsulfonphthalein excreting power of the kidneys, or the urea clearance value, is routinely obtained in all these cases. Sufficiently accurate data to guide us in their management, however, may be obtained from two simple and practical procedures — a determination of the blood nonprotein nitrogen and the concentration test. A persistent elevation of the nonprotein nitrogen or of the blood urea nitrogen level is indicative of a considerable degree of renal insufficiency. The concentration test is the most important single procedure in determining the ability of the kidney to excrete a bactericidal urine, as it detects milder degrees of deviation from normal than do the more complicated tests. This test is performed by withholding fluids from the patient from after supper in the case of infants, and from midafternoon in the case of children, until the second voiding the next morning. Failure of the specific gravity of the second specimen to rise above 1.020 indicates a potential inability of the kidneys to excrete a bactericidal urine. The blood pressure should be noted in every case so as to rule out a hypertensive state which may occur as the result of prolonged infection, sometimes without detectable impairment of renal function.[5]

Anatomic defects of the kidneys or the ureters are encountered so frequently in the presence of pyuria, and their presence may be of such value in determining whether the method of treatment should be medical or surgical, that an attempt should be made to visualize the urinary tract roentgenographically in all patients with chronic or recurrent pyuria. The easiest procedure, and one that very frequently gives adequate information, is the intravenous pyelogram. *Diodrast* is injected intravenously with the patient in a moderate Trendelenburg position on the x-ray table, and films of the kidney and bladder region are taken five, fifteen and thirty minutes after the injection. While the adult dose is 20 cc., infants require from 10 to 15 cc. and all children above the age of three years should be given the full adult dose. Fluids should be withheld from the patient from the afternoon of the day before, and the specific gravity of the urine should be 1.020 or more, if possible, at the time of the injection of the dye in order to ensure proper concentration of the excreted dye.*

The main factor militating against satisfactory pyelograms will be found to be the presence of gas in the intestines, which may obscure the detail of the dye shadows, especially in infants. No entirely reliable regime has yet been found to combat this factor. However, if the abdomen is found to be tympanitic on the day before the pyelograms are planned, the administration of 1 to 2½ dr. of compound licorice powder then, and a milk and molasses enema shortly before the x-rays are taken the following morning, will help in the expulsion of much of the gas in the bowel. The subcutaneous injection of pitressin or physostigmine shortly before the procedure is also helpful in some instances. It is a good plan to take a flat plate of the abdomen before the injection of the dye. This serves two purposes: (1) it helps eliminate the possibility of a renal stone which may be present though silent; and (2) gives information as to whether the patient's abdomen is flat enough to ensure satisfactory pyelograms without confusion from gas shadows.

*In a few cases, a macular or urticarial rash develops soon after the injection of the diodrast. Rarely, a more severe, and usually a more delayed reaction, characterized by burning and pain in the abdomen, vomiting, cyanosis and circulatory collapse, is encountered. These reactions, if encountered, should be the indication for the immediate administration of adrenalin.

Satisfactory pyelograms by this method should give: (1) a fairly reliable idea of the comparative function of the separate kidneys; (2) an indication of the amount of damage done by chronic infection; (3) a visualization of partially obstructing anomalies; and (4) a visualization of the anomalies of duplication or displacement of portions of the urinary tract.

Intravenous pyelography cannot be considered to replace cystoscopy and retrograde pyelography. Rather, it supplements these procedures, and should not be relied upon alone except in instances where excellent visualization allows clear-cut, unequivocal interpretation. In general, the retrograde method is indicated, in addition to the intravenous method, (1) when the intravenous pyelograms are unsatisfactory because of interfering gas shadows which cannot be eliminated; (2) when there is evidence of impaired function of one kidney or portion of a kidney, or an absence of a portion of the urinary tract; (3) when there is evidence of an anomaly of the bladder or urethra; and (4) when it is of special importance to examine the urine from the kidneys separately.

Cystograms have ceased to form a part of the usual study of these cases, but may occasionally be found useful in demonstrating the presence of megaloureters or obstructing lesions of the urethra, and in patients whose kidney function or general condition contraindicates ureteral catheterization.

METHOD OF USE

There are several factors of extreme importance in the management of patients undergoing treatment with ammonium mandelate. These are: (1) adequate dosage; (2) adequate restriction of fluid intake; (3) adequate acidification of the urine; (4) adequate prolongation of the treatment after the urine has been rendered sterile; (5) daily examination of the urine; and (6) frequent examination of the urine following cessation of treatment, in order to detect recurrences of infection. Experiences encountered in treating 51 patients over a period of a year and a half have convinced us that all these points are of vital importance, and that none of them can be relaxed without the sacrifice of a high therapeutic efficiency.

The ammonium mandelate is given in the form of a 10 per cent elixir.* Very few children object to taking the medication in this form. A single dose of the elixir is usually given with an ounce of water. The daily requirement is divided into four doses, given five hours apart during the day and evening to children, and every six hours to infants.

Elixir of Ammonium Mandelate

℞	Mandelic acid	50 gm.
	Water	150 cc.
	Stronger ammonium hydroxide	q. s. to neutralize (about 25 cc.)
	Aromatic elixir	180 cc.
	Syrup of cherry	ad 500 cc.

Helmholz and Osterberg[4] have shown that from 0.5 to 1.0 per cent concentration of mandelic acid in the urine is necessary for bactericidal efficiency. The medication is therefore given in an amount which will produce an average urine concentration of 1 per cent, regardless of age and assuming that the salt is excreted quantitatively. Early attempts to give this theoretical dosage resulted in what were considered alarmingly high doses when compared with the adult dose, especially in infants. Lesser amounts, however, failed to produce uniformly bacteriostatic urines, and as experience grew and no marked toxic effects were produced, the above rule was adopted.

The fluid intake should be markedly restricted. For example, the fluids, including those taken with medication and meals, in the case of a six-year-old child may be safely restricted to 500 cc. in twenty-four hours. On this regime, the child will pass about 500 cc. of urine. Thus the daily dosage becomes 5 gm. of mandelic acid, or about 12 cc. (3 dr.) of the elixir four times a day. In the absence of fever, the regularity of obtaining bacteriostatic urines has seemed to justify the drastic limitation of fluids. A suggested schedule of fluid intake and mandelate dosage which has proved adequate is shown in Table 1.

TABLE 1. *Daily Fluid Limitation and Dosage of Ammonium Mandelate According to Age.*

Age	Total Fluids	Ammonium Mandelate
Under 1 year	450 cc.	3 gm.
1-2 years	500 "	4 "
3-6 years	500 "	5 "
6-9 years	600 "	6 "
9-12 years	800 "	8 "

The acidity of the urine must be checked daily in order to ensure the maintenance of proper bactericidal action. This test is performed by adding 5 drops of a 0.04 per cent solution of chlorphenol red to 5 cc. of urine. We have used the liquid indicator rather than chlorphenol red paper, because it appeared that unless the test paper was employed with considerable experience and care, misleading low readings were obtained. The resulting color should be yellow, or yellowish orange. A brownish or pinkish tint denotes an ineffective degree of acidity and calls for prompt measures to bring the pH down to a satisfactory level. This is accomplished by omitting fruit juices and vegetables, giving less milk, and feeding more eggs, meat and oatmeal, namely, altering the diet toward an acid-ash-producing diet. If this fails, ammonium chloride, preferably in enteric-coated pills, should be given in addition. In general, very little difficulty is encountered in maintaining a uni-

formly low pH if the renal function has not been impaired.

This regime should be continued for a period of one week after the organisms have disappeared from the urine cultures. The imposing of this arbitrary limit arose from our experiences with the ketogenic diet and with methenamine, and it appears to be just as valuable when mandelate is used. If this precaution is not observed, a recurrence of the infection is likely, especially if the infection has been one of long duration. While we have no clinical data concerning the deleterious effects of prolonged administration of mandelic acid salts, or other acid-producing salts, we feel that the kidney should not be called upon to excrete a concentrated highly acid urine for more than three weeks at a time. If the urine has not been sterilized, continuation of the treatment beyond this limit is not of great promise, and is not recommended.

The problem of the prevention of repeated urinary infections is a very acute one. Indeed, it may be far more difficult to prevent a patient from having repeated attacks of pyuria than to relieve them once they have reappeared. Extreme stress has been laid by some writers on the relation of congenital anomalies and structural deformities that result from infection to recurrent infections, but little is known of the reason for repeated infections in children without these anatomic defects. In our experience the number of children who have recurrent infections has been almost half as great in the absence of structural defects as in their presence. Thus, the effort to prevent repeated infections should by no means be confined to the group in which anomalies are demonstrated radiographically. It is with this problem in mind that we recommend frequent examination of the patient and his urine for at least six months after cessation of treatment. None of the clinical reports on the efficacy of mandelic acid have in our opinion adequately stressed the importance of following these patients for a long period to determine whether the urine stays clear.

It is essential to differentiate recurrences taking place within two weeks after cessation of treatment and later ones. Our experience with the older forms of therapy showed that over half of the instances of recurrent infections, in cases followed over a long period of time, occurred within two weeks after treatment had been stopped. The return of the bacilluria and symptoms within this period we have considered to be a relapse of the original infection. Later recurrences seem to be entirely sporadic, being often encountered in the wake of colds or other causes for a lowered general resistance to infection, or accompanying a vaginitis, often one due to pinworm infestation. This type of recurrence we look upon as a new infection or a reinfection in an individual probably more than normally susceptible to urinary infections.

This differentiation seems justified in view of the different steps which seem logical for the prevention — if this be possible — of these repeated infections. In the first, or immediate, type we have noticed a decrease in the number of recurrences when urinary antisepsis is maintained for at least a week after the urine cultures become sterile. In the second, or late, type more general measures, designed to maintain the general bodily resistance to infections and proper genital hygiene, seem indicated, although these by no means are invariably successful.

RESULTS OF TREATMENT

During the past eighteen months, we have treated with mandelic acid salts 51 patients with acute, chronic or recurrent infection of the urinary tract. Of these cases, 39, or 76 per cent, so far as we know are free from their urinary infection at present. Table 2 summarizes the results of treatment in 40 consecutive cases treated from November, 1935, to November, 1936. They are summarized separately because we have been able to follow most of them for at least six months after discharge from the hospital, and because such an analysis gives a more accurate conception of the clinical course of such patients than one which includes the results of recently treated cases. The children were followed for an average of 3.4 months after discharge, and the infants 3.9 months.

TABLE 2. *Summary of Results of Treatment.*

Class	Number of Cases	Success*	Failure	Failure to Sterilize	Recurrence E	Recurrence L	No Follow-Up	Reaction
Children								
I	5	5	0	0	0	0	0	0
II	9	5	4	3	1	1	1	4
III	11	11	0	0	0	3	2	0
Infants								
I	9	8	1	1	0	1	1	0
II	3	0	3	2	1	0	1	0
III	3	3	0	0	0	0	1	1
Totals	40	32	8	6	2	5	6	5

Class I — Acute infection without anomalies in the urinary tract.
Class II — Chronic or recurrent infection, lasting over 2 months, with associated anomalies.
Class III — Chronic or recurrent infection, lasting over 2 months, without associated anomalies.
*Includes cases which suffered recurrent infection and have been retreated with mandelic acid, and were well at last visit.
E — Bacilluria recurred within 2 weeks after stopping treatment.
L — Bacilluria recurred later than 2 weeks after stopping treatment.

In most respects, the distribution of the types of cases of this study agrees with other groups of cases studied in this clinic. The cases with anomalies were uniformly those in which surgical intervention was considered to offer no benefit. Bacteriologically, however, these cases are unusual in that the primary bacilluria was due to an organism other than the colon bacillus in only 2

cases; in these, an atypical member of the paratyphoid group was responsible for the infection.

Two of the children in whom mandelic acid therapy failed to bring about sterilization of the urine had gross anatomic defects. Another child had advanced chronic interstitial pyelonephritis with hypertension. Three of the infants whose infections were not benefited were the first in our series to receive mandelate therapy.

Five of the patients showed untoward reactions to treatment. Two of these patients exhibited mild albuminuria and the presence of casts in the urine sediment, and 1 complained of epigastric distress following each of the last three doses of ammonium mandelate in his course of treatment. Another child, who had a tuberculous infection of the kidneys in addition to a *E. coli* bacilluria, showed gross hematuria. One child with rather marked impairment of renal function with hypertension developed vomiting, acidosis and intense thirst following an ill-advised attempt to acidify the urine further with ammonium chloride. All these patients were being given an additional acid-producing salt in an effort to maintain a satisfactory urinary acidity. None of these untoward effects resulted seriously, and all disappeared promptly with the resumption of a liberal fluid intake.

Albumin and casts have been encountered in the urine with an equal frequency, and hematuria with a greater frequency, in the course of methenamine therapy for similar conditions. These effects we believe to be primarily the result of the excretion of a highly concentrated and highly acid urine, rather than of the presence of mandelic acid as such. We can find no evidence that the albumin or casts represent any permanent damage to the kidney.

DISCUSSION

If good results could be obtained by treating every patient with pyuria with ammonium mandelate, there would be no need for a detailed study of the urinary tract such as has been outlined. Quite a few cases, however, definitely require surgical intervention, and a considerable number of cases in which surgical procedures are not indicated cannot be helped by urinary antiseptics of any sort. Infections with organisms which are resistant to the action of mandelic acid are fortunately not often encountered in children. If the kidney function is good, however, and if there are no severe anomalies, an intensive trial on mandelate therapy may be justified, for some of these infections do clear up under such circumstances.

The result of long-standing chronic pyelonephritis in some children, if not successfully treated, is a hypertensive state which may terminate in uremia. The knowledge of this not too uncommon end result of chronic infection should encourage us to employ the best methods available to control urinary infections in their initial stages and prevent them from becoming deep-seated and chronic.

CONCLUSIONS

The primary usefulness of ammonium mandelate as a urinary antiseptic is in patients with acute, recurrent or chronic urinary tract infections caused by organisms which are inhibited by mandelic acid. Successful results may be expected in a high percentage of patients if there is good bilateral renal function, if the patient is in the afebrile stage at the time of treatment, if there are no obstructive anomalies of the urinary tract, and if the details of treatment are carefully followed.

I am indebted to Dr. Harry F. Dietrich for permission to include the analysis of the first 15 cases in this report, to Dr. John W. Regan, who performed bactericidal tests on the urines of many of the patients, and to the Mallinckrodt Chemical Works, Saint Louis, Missouri, for a generous supply of mandelic acid by which this study was made possible.

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Discussion

The Chairman: The discussion will be opened by Dr. Harold L. Higgins.

Dr. Harold L. Higgins, Boston: Dr. Wheeler's paper is an excellent one, indicating the potentialities of mandelic acid in the treatment of pyelitis, and instructing us in the management of a patient with pyuria. His experience with mandelic acid is many times greater than mine. I have no criticism to make; his outline is one which I shall follow in treatment with mandelic acid.

I wish to comment briefly on pyelitis and to discuss a probable mechanism of the action of therapeutic agents, including mandelic acid.

Pyelitis is principally a disease of girls, rarely one of boys. Many theories have been advanced for this. It has been claimed that it is an ascending infection, but pathologists have argued convincingly that this is not so. More recently, obstruction of the ureters has been advanced as a background. Obstruction leads to retention, and to infection usually by *Bacillus coli* which probably enters through the kidney and by diapedesis from the bowel. With release of the obstruction, drainage of the pelvis is obtained and the infection clears up.

What are the causes of the obstruction? First, anatomic abnormalities (congenital) or tortuous ureters, which may kink or be pressed upon by aberrant vessels (or in pregnancy, by the uterus); secondly, spasm of the ureter; and thirdly, edema of the ureteral mucous membrane. Combinations of these are quite possible.

Probably no medicinal or antiseptic treatment will re-

lieve more than temporarily a pyelitis based on anatomic abnormality.

Spasm of the ureter is a field for interesting speculation. One is inclined to compare it with asthma (spasm of the bronchi). Is it allergic? Probably it is at times. Is it reflex? Quite likely; but reflex to what? Where is the inciting cause? The vagina (vaginitis)? The vestibule? The urethra? Dr. Wheeler suggested pinworms as a possible etiologic factor in pyelitis. Treatment would seem to be the removal of the irritating cause of the spasm, or the medicinal relief or deadening of the spasm.

Edema of the ureteral mucous membrane may accompany spasm, or precipitate it, or be independent of it. In talking to the parents of my patients I have frequently spoken of pyelitis as being a "cold in the kidney"; its significance is much the same as a "cold in the nose"; it is usually mild, but it may be severe. Certain illnesses — virus infections, grippe, measles — lead to an enanthem, or erythema of mucous membrane. Occasionally the ureter is involved. Also, consider how often acute hemorrhagic nephritis is accompanied by pyuria! Is it edema? Frequently we recognize in our pyuric cases that a cold in the nose and throat is an indication of a recurrence of pyelitis — sympathetic involvement of another mucous membrane, we suggest. Tonsillectomy has been tried, and not without benefit for recurrent pyelitis.

How may one relieve edema of the ureters? Our line of procedure may be the same as that of edema of the nose in a child with chronic or recurrent colds. In our work with ketogenic diets in epilepsy, we noted that our patients were remarkably free from colds. We have, in fact, carried it even further, and have treated children with frequent colds in winter by lowering the carbohydrate of the diet (no candy, limited dessert, bread and potatoes) and raising the fat (more butter, cod liver oil, and so forth). The ketogenic diet is also of value in pyuria. Dr. Wheeler showed this quite effectively in a paper at our meeting in Worcester three years ago. At that meeting I suggested that the beneficial action of the ketogenic diet might be explained on the basis of dehydration of the tissues — that they become firm instead of waterlogged. I believe that the benefit of a ketogenic diet in pyelitis lies quite as much in its relieving edema as in its bactericidal action.

When one considers the mandelic acid treatment, if it is effective, one notes that the patient is dehydrated; water intake is obviously curtailed in order to increase the mandelic acid concentration in the urine, but according to my observation its dehydrant effect is seen in the fact that children lose from 1 to 3 pounds during the first two days.

Successful urotropin treatment of pyelitis calls for dehydration.

In conclusion I offer the opinion that benefit of mandelic acid therapy in pyelitis may be quite largely due to dehydration; the treatment may be somewhat effective in relieving spasm of the ureters as well as edema. It is not efficacious in relieving anatomic defects, which may be the bases of the unsuccessful cases. The bactericidal element of mandelic acid is no greater than that of many other urinary antiseptics which are not so efficacious in pyelitis.

THE CHAIRMAN: Dr. Wheeler's paper is now open for general discussion.

DR. JAMES L. WILSON, Boston: I should like to emphasize one point that Dr. Wheeler made. That is, that a study of all the cases of pyuria in the hospitals in the last few years has resulted in an amazing increase in the efficacy of medical treatment, so much so that I think we should take an entirely different attitude in our follow-up work from that which we have taken in the past, particularly those of us who are dealing with large public clinics. We are quite accustomed to being very conscientious in the follow-up of children with congenital syphilis, tuberculosis and rheumatic fever; I think we can say that we have such a percentage of success in the treatment of pyuria that we must take a similar attitude toward this disease, and not be satisfied with a urine free from pus, since that may be only a remission of a chronic pyuria. There should be a follow-up for months, possibly even years. We have already had quite a few instances of the tragedy of seeing a child come in for treatment with irreparable renal damage, when if we had had a good follow-up we might have avoided this result. When a kidney reaches the stage where urine can no longer be concentrated, we usually get hypertension, and can do little for the child by the use of mandelic acid.

THE CHAIRMAN: Is there any further discussion? Are there any questions? If not, Dr. Wheeler, will you close the discussion?

DR. WHEELER: I am very glad that Dr. Higgins brought out the point about the dehydrating effect of mandelic acid, because I think it is of great importance. He is certainly right in saying that patients lose from 1 to 3 pounds in the first day or two of treatment. There are a considerable number of substances like hexylresorcinol and various dyes which produce urines which are bactericidal when tested in vitro. But none of these have the same curative value in patients with bacilluria that mandelic acid has.

We have three methods, to my mind, of adequate treatment in attempting to sterilize the urine. They are the ketogenic diet, methenamine and ammonium chloride in large doses, and mandelic acid. A successful regime under any of these methods involves a marked restriction of fluid intake, with the production of urine of high acidity. The patients all undergo some initial loss of weight, and the results of treatment are quite comparable. Whereas 76 per cent of the present series of patients could be called successful, in 48 similar cases in a previous study at the Children's Hospital in which methenamine and ammonium chloride were used, about 78 per cent were successful; in 45 patients treated with the ketogenic diet, 75 per cent were successful. The common factor in comparing these forms of treatment with other urinary antiseptics is that all these cause the excretion of a highly acid urine and the same initial water loss from the body.

It appears to me that each of these three treatments achieves about the same result; the reason we are using mandelic acid is that it involves a regime which is easy to carry out effectively and which is pleasanter to administer. There are apparently a large percentage of cases of bacilluria which are amenable to treatment with this type of urinary antiseptic. The cases which cannot be cleared up in this manner I think will not respond to any other urinary antiseptic we know of.

THE CHAIRMAN: There is one bit of business, and, so far as I know, the only one, before the Section — the election of officers for next year. I appoint as a nominating committee, Dr. Higgins, Dr. Coburn and Dr. Rubin, to present nominations for chairman and secretary for next year.

The next paper on our program is "The Surgical Significance of Melena in Childhood" by Dr. William E. Ladd.

THE SURGICAL SIGNIFICANCE OF MELENA IN CHILDHOOD

WILLIAM E. LADD, M.D.*

BOSTON

IT is sometimes more valuable to present a paper on a symptom than to follow the customary procedure of discussing some particular disease or condition. With this idea in mind, I have selected the symptom of melena, considered with particular reference to its occurrence in children, to the diagnosis of the clinical entities of which it may be a symptom, and to what surgery has to offer for its treatment.

If we turn to the earlier textbooks on differential diagnosis, we find intussusception mentioned as one of the few conditions causing blood in the stools in children. Even in more recent books, some of the conditions commonly seen at the Children's Hospital are either not considered at all or are given but little emphasis. I imagine that in the case of physicians or surgeons whose main interest lies in adult practice, blood in the stools brings to mind conditions commonly found in the adult rather than those occurring more frequently in children. Would it not be correct to say that melena suggests to the practitioner hemorrhoids, anal fissure, cancer of the rectum or colon, dysenteries of various types, blood diseases such as hemophilia and purpura, portal congestion from diseases of the heart or liver, and gastric or duodenal ulcer or carcinoma? While it is true that many of these conditions may occasionally occur in the child, they are not the common causes of melena in this age group, nor are they the ones possessing surgical significance.

It would serve no useful purpose to try to include in a paper of this length all possible causes of bleeding from the alimentary tract; so let it suffice to consider some of the commoner causes, as well as some of those which are rarer but have particular surgical interest. These conditions or diseases are, in the order of their interest, intussusception, Meckel's diverticulum, intestinal duplications, polyps, idiopathic ulcerative colitis, hemorrhagic disease of the newborn, purpura, splenomegaly with hematemesis, anal fissure, foreign body, and certain other rare diseases.

Intussusception is a common disease of infancy, and one in which a correct early diagnosis and prompt surgical intervention are of paramount importance. In an analysis of the records of 434 cases occurring in the Children's Hospital, the appearance of blood in the stools was a prominent symptom in 377, or 86 per cent. When the blood first appears in the stools it may be mixed with feces, but as the disease progresses the blood becomes unadulterated except for the admixture of a small amount of mucus.

If we now hark back to the history, symptoms and physical examination, we find that this disease occurs most commonly in the first two years of life, and that the peak of incidence is in the seventh month. The infant is typically above the average in health, weight and nutrition. The onset is sudden and the pain severe, as evidenced by the child's doubling up, turning pale and vomiting. The initial attack of pain may be of only a few minutes' duration, and is followed by an interval of relief and an appearance of well-being, which in about fifteen minutes is succeeded by a return of the pain. It is the healthy appearance of the infant and the periods of remission which lead to the failure of the physician to make, or even suspect, the diagnosis of intussusception at his first visit when it is so essential to make it. It is a doctor's natural inclination to disregard the mother's story when he visits a fine, healthy-looking baby who is asleep or contentedly playing. If a careful abdominal examination were made of every baby whose parent stated that he had had severe pain or vomiting or whose stools showed blood, very few cases of intussusception would be missed, and if a competent surgeon is at hand, a death from this disease should be a decided rarity. Abdominal examination allows one to feel a mass somewhere along the course of the colon in the vast majority of cases. The mass is rounded or sausage-shaped, firm to the touch, nontender, and may be slightly mobile. There are only two stages of the disease during which the mass is difficult to palpate. One occurs early, when the invagination has advanced only to the hepatic flexure and is difficult to feel on account of the overlying liver; the other comes late, when the mass is obscured by general intestinal distention. Under the latter circumstance a rectal examination usually makes it possible to distinguish the mass when an anterior abdominal examination has failed. In rare instances, when the story suggests intussuception and abdominal and rectal examinations do not reveal a mass, an examination should be made under an anesthetic in the operating room, the surgeon being prepared to operate if this procedure reveals the mass. When this technic does not make the diagnosis clear, a

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barium enema in very rare instances may be of value.

The best treatment of intussusception is surgical. From 1908 to 1936, 434 such patients have been treated at the Children's Hospital, with better and better results. If this improvement continues for another seven years at its present rate there will be no mortality. In the last eight years no death has occurred in a patient who was received at the hospital within thirty-six hours of onset of the disease. The causes of the improved results in order of importance are, first, earlier diagnosis, secondly, improved surgical technic, and thirdly, better preoperative and postoperative care. Deaths from intussusception should be classified as preventable, and they can be prevented by making the diagnosis early and referring the patient at once to a competent surgeon.

Though the vitellointestinal duct was described by Meckel in 1815 as persisting in postnatal life, only recently was an attempt made to diagnose this condition prior to operation. The patients who had lesions of this diverticulum were usually operated on after an erroneous diagnosis of appendicitis or of intestinal obstruction. The frequency of melena as a presenting symptom in patients with Meckel's diverticulum, as has been pointed out by Hudson and others, should sometimes make a correct preoperative diagnosis. In 47 cases taken from the records of the Children's Hospital, blood from the rectum was noted in 27, or 57 per cent. The blood may be fresh and bright if peristalsis is active, or changed and dark if peristalsis is sluggish. The amount of blood is sometimes small, but in several instances in this series it has been very large and sufficient to cause collapse, marked pallor and a sharply reduced red blood-cell count and hemoglobin. The appearance of blood in the stools in a patient presenting symptoms of acute abdominal pain and vomiting, and with physical signs suggesting appendicitis or intestinal obstruction, but without the presence of the mass found in intussusception, is strongly suggestive of Meckel's diverticulum. There are two sources of bleeding in patients with this ailment. First, it is common to find aberrant gastric mucosa in the lining of the diverticulum, and at the edge of this mucosa a bleeding ulceration. Secondly, the bleeding may result from obstruction, or by the diverticulum's becoming inverted and acting as the advancing point of an intussusception. When a presumptive diagnosis of Meckel's diverticulum has been made, operation should be resorted to at once so as to avoid the serious complications that accompany delay.

The mortality from this disease is still unduly high, and in our series, at least in the majority of instances, late diagnosis was a vital factor. In 3 instances, perforation of an ulcer with resulting peritonitis had taken place before the child was admitted to the hospital. In 6 other instances, intussusception with the diverticulum as the advancing point was present. In these 6 cases the intussusception was of such long duration that it was irreducible, and intestinal resection had to be performed. Though it is much more difficult to make the diagnosis of Meckel's diverticulum than that of intussusception, a presumptive diagnosis should be made earlier and more frequently than it is at present and if so, a drop in mortality will result.

Another rare congenital malformation is included because it is sometimes confused with Meckel's diverticulum, and because it is of exceptional interest from an embryologic and surgical point of view. I refer to the duplications of the alimentary tract. These cases have been classified under various headings — unusual Meckel's diverticulum, ileum duplex, giant diverticulum, enteric cyst and so forth. Such duplications are not the result of arrested development and persistence of the vitelline duct, nor should they be confused with the pulsion diverticula of adult life. They may occur at any point along the alimentary tract, but are most commonly found in the ileum. A similar condition has been found in the alimentary tract of pigs, cats, rabbits and sheep. The embryologic explanation of this condition is not clear enough to permit any more explicit statement than to say that this is an abnormal development found in man and lower animals. Of 12 cases that we have seen in the Children's Hospital, 8 have occurred in the abdominal cavity, 3 in the chest and 1 in the mouth. Melena was a prominent symptom in 3 of the 8 cases which occurred in the abdomen. The blood may come from an ulceration, from the congestion of pressure of the cyst, or from the congestion associated with obstruction. Other symptoms which were present in all 8 cases were vomiting and abdominal pain or discomfort. Evidence of undernourishment and a history of feeding difficulty are common. In a recent article on this subject I stated that duplication of the alimentary tract should be considered in any child suffering from symptoms of partial intestinal obstruction, in whom an abdominal tumor is felt. When blood is found in the stools and the symptoms are less acute than those of intussusception, or when the tumor is larger than one would expect in a case of Meckel's diverticulum, duplication of the intestine should be strongly suspected.

Although it is not my present purpose to discuss surgical technic, it seems pertinent to digress momentarily in that direction. It is a temptation for the surgeon who unexpectedly finds one of these duplications for the first time to attempt to dissect it from the normal intestine. This is feasible only

in the cases which are completely detached from the normal gut and have a mesentery of their own. In the other cases, which are commoner, the normal intestine and the duplication have the same blood supply, and there is no line of cleavage between them. It is impossible to dissect out the cyst and leave the normal bowel viable. Both cyst and the normal bowel to which it is attached must be resected, and an anastomosis performed. There have been 2 deaths in this small series at the Children's Hospital. One occurred in a patient in whom an unsuccessful attempt had been made to dissect the duplication; he died subsequent to a later operation. The other patient who died had obstruction, perforation and peritonitis before coming to operation. All the other patients have made gratifying recoveries.

Polyps of the rectum and colon are usually considered to be relatively insignificant findings, yet from their frequency and occasional seriousness they demand attention. In the vast majority of instances, melena is the only symptom of which the patient complains. The blood is characteristically bright, and on the outside of or separate from the stools. Occasionally pain is associated with the bleeding. In a few instances diarrhea has also been a concomitant symptom. If the bleeding has been of long duration, a secondary anemia of marked severity may be present. In looking over the records of 49 cases of polyps occurring in the last five years at the Children's Hospital, it is apparent that the apprehensiveness of the parents is a highly variable factor. The earliest time at which a mother sought medical advice after seeing blood in her child's stools was one day, and the latest four years. It is common for the parent not to bring the child to the hospital for several months after first noticing the blood. This has usually done slight harm beyond causing some secondary anemia and listlessness.

The polyp, if located in its commonest place, namely a few centimeters inside the anus, can easily be removed by transfixing the pedicle and excising with the actual or electric cautery. This procedure is as a rule curative. Occasionally the humble polyp causes a situation demanding some surgical skill and considerable surgical judgment. The summary of such a case will illustrate this point.

R. A. L., a boy of 3½ years, entered the Children's Hospital in December, 1936, with the chief complaint of rectal bleeding of 1 year's duration. The physician who was consulted at the time of the onset of the bleeding prescribed a diet. Three months later the physician and diet were changed, but the bleeding persisted for another 6 months, when the parent noticed something protruding from the anus. The child was then taken to a hospital, where a polyp was removed from the lower rectum. The bleeding persisted, and a month later proctoscopic and x-ray examinations were made at the same hospital. As the result of these examinations, the father was advised to have the child subjected to a colectomy. When the boy was brought to the Children's Hospital, examination showed two rectal polyps just inside the sphincter and two bleeding areas high in the descending colon. The impression that the bleeding areas gave was that they might be the pedicles of polyps which had sloughed off. The lower polyps were removed in the usual way with ligature and cautery. The upper bleeding points were cauterized with silver nitrate through a sigmoidoscope. Following this procedure the symptoms were ameliorated, but later returned. Another proctoscopic examination made 6 weeks later showed two polyps the size of cherries at the site where the bleeding points had previously been noted. Barium enema gave no evidence of lesions above the distal portion of the transverse colon. In February, 1937, three polyps were removed by laparotomy, the two which had been seen through the sigmoidoscope, and one at the distal end of the transverse colon. The convalescence was uninterrupted, and there has been no return of the bleeding to date. From previous experience with 4 other patients in whom similar operations had been performed, it seems probable that this procedure will be curative and that the child will grow up with his colon instead of without it.

Although the microscopic picture of such polyps as just described is identical with that found in the multiple polyposis occurring in chronic idiopathic ulcerative colitis, the pathogenesis must be different. In the former instance conservative surgery has proved adequate, while in the latter the most radical surgery is called for.

Idiopathic ulcerative colitis is one of the inflammatory conditions which have a surgical implication. The diagnosis is arrived at largely by a process of careful elimination of other diseases. The blood is mixed with mucus and liquid feces, and is associated with a history of a profuse diarrhea of long duration. The stools have an offensive odor. The diseases which it is most necessary to eliminate before arriving at the diagnosis are amebic dysentery, chronic bacillary dysentery and the acute dysenteries caused by the paratyphoid group of organisms. The rarer conditions which should be ruled out are malignant disease, diverticulitis and polyposis. The following methods are used for confirming this diagnosis. First, the patient is confined to bed on a low-residue diet. Next, complete physical, blood and urine examinations are made, followed by Wassermann and tuberculin tests. The serum is then tested for agglutinins against various bacilli of the dysentery group, the paratyphoid bacilli, *Bacillus enteriditis* and *B. abortus*. Several stool cultures are taken, and by special technic, amebas are sought in the stools and in material swabbed from the ulcerations. Proctoscopic examination shows a quite characteristic picture in cases of idiopathic ulcerative colitis; the mucous membrane appears red and

diffusely granular, with minute ulcerations and almost no normal-appearing mucous membrane. X-ray examination by barium enema in the early stages shows evidence of irritability in the multiple small haustrations; late in the disease the haustrations are obliterated, and the colon becomes contracted and is commonly described as looking like a metal pipe.

There is still some disagreement as to what role surgery should play in chronic ulcerative colitis. It is undoubtedly true that there are a few patients who present mild symptoms and who improve under long periods of rest on a low-residue or bland diet. Omitting this group of mild cases, it must be granted that ileostomy has proved a life-saving procedure in many instances. The time at which it should be performed is of extreme importance, and must be decided upon in each case according to the severity of the symptoms, the age of the child and the experience of the surgeon. Roughly speaking, the younger the child the earlier the ileostomy should be performed. In young children the chance of early fatal perforation, peritonitis or obstruction appears to be greater than in later life. Furthermore, since children have higher regenerative and recuperative powers than adults, there is a definite possibility of being able to close the opening successfully if the ileostomy has been done before there is marked structural change in the colon. At the Children's Hospital there have been 5 cases of successful closure of enterostomy openings that have been present for two years or more. These patients have remained free of symptoms for periods of time varying from a month to five years.

From the hospital records it appears that there have been 7 patients with chronic ulcerative colitis who have apparently recovered following medical treatment only. Most of these cases were of the milder type of the disease. Of 20 other patients in whom the symptoms were more severe, none recovered following medical treatment only, carried out for variable periods of time. Nine patients subjected to surgical procedures are living. Five of these, mentioned above, have had an ileostomy followed by closure, and in 4 the opening still persists. From whatever angle this disease is considered, it presents a difficult problem. The deaths have been largely due to complications, such as perforation, peritonitis, carcinoma or obstruction. Our present opinion is that ileostomy should probably be done earlier than it has been done in some instances, and that with the greater reparative ability of the child as contrasted with the adult, the opening may be closed in some cases without a recurrence of symptoms.

Hemorrhagic disease of the newborn has been largely removed from the province of the surgeon in recent years, through simplification of the technic of transfusion, and because this therapeutic procedure has been made available to pediatricians. This disease usually occurs in the first week of life. The commonest site of the bleeding is the umbilical cord, and the next commonest the alimentary tract. The bleeding may be small in amount and become spontaneously arrested, or be profuse enough to prove fatal unless controlled. The tendency is short-lived as contrasted with true hemophilia, and is distinguished from it by this characteristic, by the lack of family history and by the blood findings. Transfusion is virtually a specific for this condition, and has markedly reduced the mortality. In the present day, when major operations are not infrequently performed on the newborn, it is most essential for the surgeon to remember the possibility of this condition. When undertaking an abdominal operation, for example, in the first few days of life, it is a wise precaution to give a small prophylactic transfusion.

Henoch's or visceral purpura is important to the surgeon mainly because at its onset it may closely resemble some of the surgical conditions demanding early operation. The melena of this type of purpura may appear prior to any skin manifestations, and being associated with abdominal cramps and pain may lead to an erroneous diagnosis of intussusception. In other instances where an exudation of serum has taken place into the intestinal wall of the ileocecal region, localized tenderness and spasm may be present, leading to the incorrect diagnosis of appendicitis.

Idiopathic purpura (thrombocytopenic purpura) is a more serious condition than any of the other forms of symptomatic purpura. It may be chronic or recurrent. It is characterized by hemorrhages from the various mucous membranes and by cutaneous or subcutaneous ecchymotic spots. Intestinal bleeding, though not a particularly frequent manifestation, may be very profuse, and when associated with bleeding from other mucous membranes, may be sufficient to prove fatal. Examination of the blood in this disease shows a marked diminution in the platelet count and an increased bleeding time. The clotting time is not increased, but the clot fails to retract. These findings are in marked contrast to those in hemophilia, where the platelet count is not markedly decreased and the bleeding time is normal, but the clotting time is always delayed and the clot retracts normally. The preferred treatment is transfusion, splenectomy, or both. Transfusion has proved quite successful in this hospital, but it must be frequently repeated; in fact, a single transfusion is often insufficient to stop the bleeding of an attack. Splenectomy is a logical procedure. In the Children's Hospital we have performed this operation only six times. It has appeared to be a life-saving procedure in some instances, and is recommended when transfusion is not effective. Hemophilia will not be discussed

here, since melena is a rare manifestation of the disease, and its surgical significance consists only in the fact that it should be recognized and surgical procedures avoided when present.

Splenomegaly with hematemesis and of course melena as well, will not be dealt with in detail as the hematemesis is usually a much more striking manifestation of the disease than is the melena. Suffice it to say that this malady should probably be considered as a clinical entity apart from Banti's disease. It may be actually a disease of the blood or blood vessels rather than of the spleen. The bleeding usually takes place from varices at the lower end of the esophagus. Splenectomy alone has not provided an effective remedy. In recent years an attempt has been made to lessen the blood supply to the lower end of the esophagus by tying off the coronary vessels and diverting the portal return by omentopexy. It is as yet too early to know what our results will be.

Anal fissure would seem hardly worth mentioning but for the fact that patients with this malady are referred to us from time to time with the diagnosis of intussusception. The characteristic story of pain on defecation, with blood, sometimes in large quantity, on the outside of the stool or following it, suggests the diagnosis, and rectal examination confirms it. Many children with fissure recover after relief from constipation. In some instances this must be supplemented by mineral oil by mouth, oil enemas and stretching of the anal sphincter.

Blood in the stools caused by swallowing a foreign body must always be thought of, but it occurs with surprising rarity considering the large variety of articles, many of them sharp, which appeal to the child's appetite. The open safety pin appears to be considered the tastiest morsel and is the one most frequently found, next come coins and buttons, and finally toys. Of the latter group one of the most surprising we ever found was a streamlined train! The old rule that anything which will pass the cardia will pass the rest of the way has comparatively few exceptions. The train was passed without difficulty and gave no symptoms. In the Children's Hospital there have been no fatalities from foreign bodies which have reached the stomach unaided. We watch open safety pins with the x-ray, and do not operate unless the pin remains in the same place and in the same position for more than a week, or unless symptoms develop; as a result, the operations are few.

Among the rarer conditions which have melena as a symptom should be mentioned tuberculosis, which in recent years is very uncommon, and the granulomas and sarcoids, often classified under the confusing title of "regional ileitis."

This article by no means covers all the causes of melena in childhood, but demonstrates the wide variety of conditions of which it is a symptom. Blood in the stools should be considered a signpost directing one to a careful investigation, a complete history and a thorough physical examination, including the rectum. In some instances this will suffice for a correct diagnosis. In others, these procedures must be supplemented by an expert bacteriologic, hematologic, and x-ray study; even then, a few cases will be seen in which the cause of the bleeding remains unexplained.

300 Longwood Avenue.

DISCUSSION

THE CHAIRMAN: The discussion will be opened by Dr. Richard M. Smith.

DR. RICHARD M. SMITH, Boston: Dr. Ladd has presented the differential diagnosis of blood in the stools so thoroughly that it seems unnecessary to add anything to his remarks on that phase of the subject. It is, however, important for us to remember as medical men that children who show melena deserve careful study. Not all children having this condition require surgical treatment, and those who do not should be continued under medical care. Chronic ulcerative colitis is one of the conditions which, in the early stages, require medical treatment. The diagnosis of the disease is reached only after the elimination of other conditions producing similar symptoms. This procedure involves careful clinical and laboratory investigation. The point I wish to emphasize is the necessity for careful study of all children presenting blood in the stools, and the necessity for considering a wide variety of conditions which may give rise to this physical sign.

THE CHAIRMAN: The paper is now open for general discussion.

DR. THOMAS H. LANMAN, Boston: I want to emphasize again that the reduction in mortality in cases of intussusception was most marked in those that were recognized early. As Dr. Ladd said, we have lost no case in the last few years where the diagnosis was made and the patient was operated on within thirty-six hours of the onset. Cases that have come to us after forty-eight hours or later show little reduction in mortality, especially those cases where resection has been resorted to. In this last group we have very few cases that survive. Whether we reach our goal where there will be no mortality from intussusception depends largely on the physician who sees and diagnoses the case.

THE CHAIRMAN: Any further discussion or any question? If not, will you close the discussion, Dr. Ladd?

DR. LADD: I should like to add that, when in years gone by, I have been in various doctors' offices when parents have called up and complained that their children had a stomach-ache, the doctor frequently ordered a dose of castor oil over the telephone without making any examination. I consider that a most dangerous practice and the cause of high mortality in some of the conditions that confront us.

THE CHAIRMAN: The nominating committee reports the following for officers during the next year: for chairman, Dr. Paul W. Emerson, of Boston; for secretary, Dr. James M. Baty, of Boston. Will someone make a motion that Dr. Baty cast one ballot for these men?

It was so moved and seconded.

THE CHAIRMAN: It is moved and seconded that the secretary be empowered to cast one ballot for Dr. Paul W. Emerson as chairman and for himself as secretary. Dr. Baty having done so, these men are elected.

If there is no other business, the meeting will stand adjourned until next June.

THE DETECTION AND MEASUREMENT OF THE ELECTRICAL CONCOMITANT OF HUMAN OVULATION BY USE OF THE VACUUM-TUBE POTENTIOMETER

JOHN ROCK, M.D.,** JEAN REBOUL, M.A.,† AND HAROLD C. WIGGERS, PH.D.‡

BROOKLINE, MASSACHUSETTS

BECAUSE study of the commonly known physiologic consequences of ovulation has given comparatively inaccurate insight into the time of human ovulation, we have attempted to investigate its possible electrical concomitant. Burr, Hill and Allen[1] demonstrated that a difference of potential arose with ovulation in the rabbit and that this electrical disturbance could be measured by a vacuum-tube potentiometer.[2] Reboul, Friedgood and Davis[3] confirmed these very significant observations on rabbits. Reboul and his co-workers showed that "during half an hour before the first ovulation, the vagina becomes increasingly negative. . . . The potential difference passes through a maximum of 6 to 10 millivolts within thirty seconds and returns gradually to its former level in ten or fifteen minutes." They continue: "In absence of ovulation or movements of the electrodes, we have never seen spontaneous changes of potential greater than 1 millivolt during experiments lasting three or four hours." After four preliminary trials directed to the improvement of the apparatus, we have obtained such results with one patient as warrant a report of progress.*

Our plan is to select from among the patients recommended to the hospital for laparotomy those of even temper, between the ages of twenty-five and thirty-five, whose menstrual cycles are fairly constant in length, and whose condition requiring laparotomy should not theoretically interfere with ovarian behavior. From such a patient's recorded menstrual history the earliest probable and the latest probable dates of a subsequent menstruation are computed. Ovulation, it is assumed, would likely occur between the sixteenth day before the earliest probable menstrual flow and the twelfth day (inclusive) before the latest probable menstrual flow. We intend to observe changes in the electrical potential between an abdominal and a vaginal lead. The means for this observation in the case here reported seem to have been adequate though not perfect. Details of the first successful experiment follow.

The patient was shaved as for a perineal and abdominal operation. She was given a cleansing douche and an enema. During the test she was placed on constant urinary drainage. She was given a low-residue diet, and 10 minims of deodorized tincture of opium, three times each day. The pubic hair was shaved. In the skin of the abdomen just above the hairline was made a scratch barely deep enough to release blood-stained serum but not free blood. For both leads, silver — silver-chloride nonpolarizable electrodes[2] mounted on platinum wire were used; these were partially immersed in agar jelly (3 to 5 per cent solution of agar in normal salt solution). The jelly for the abdominal lead was held in a dish-like pyrex glass container. The nonpolarizable electrode was inserted through an inlet (Fig. 1B). The glass dish was then inverted over cotton wet with salt solution and was held in place by strips of adhesive plaster. For the vaginal lead an open pyrex glass cylinder, 15 cm. long, with one bell-shaped end, 3 cm. in outside diameter, was used (Fig. 1A). This was placed against the cervix, being held there by the perineal muscles inferior to the bell-like enlargement. Like the dish, the cylinder was

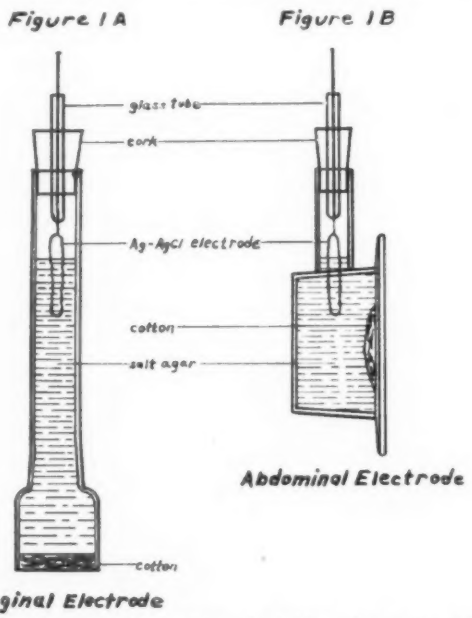

FIG. 1. Diagram of glass appliances for holding silver — silver-chloride electrodes.

From the Fertility Clinic of the Free Hospital for Women and the Department of Physiology of the Harvard Medical School, aided in part by a grant from the Permanent Charity Fund to the Harvard Medical School.

*Since submitting this paper a second experiment has been equally successful, giving a record of potential changes almost exactly similar to those reported here, and operative results equally conclusive. A recent note (A bio-electric record of human ovulation. Science 86:312 [Oct. 1] 1937) by Burr, Musselman, Barton and Kelley offers further confirmation.

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partially filled with agar jelly. Against the jelly in the large end was placed a wad of cotton soaked in salt solution, which lay between the cervix and the agar. Into the open end of the glass tube which projected from the introitus was placed the silver — silver-chloride electrode, partially imbedded in the agar.

When the test lasted longer than forty-eight hours, at the end of this period the electrodes were removed, the patient was given another enema and douche, and the electrodes were replaced.

The nonpolarizable electrodes were connected to the posts of the stabilized vacuum-tube potentiometer by shielded microphone cables. The vaginal electrode was on the grid; the abdominal lead was grounded. The mirror of a moving-coil galvanometer projected a reflected beam on a centimeter scale. The position of this beam was recorded every five minutes, except during its most active excursions, when it was recorded every three minutes. For the experiment reported here, the potentiometer was adjusted so that a deflection of the reflected beam of 3 cm. was equivalent to the development of an electrical potential difference of 1 millivolt between the two electrodes.

The patient whose test is reported was Mrs. C., a thirty-four-year-old white woman, who had been married for seven years. Coital habit was normal, and no contraceptives had been used. In March, 1937, she complained of increasing dysmenorrhea, dyspareunia and sterility.

Her menstrual history was as follows. She began to menstruate at fourteen, was regular, about every twenty-eight days, flowed four or five days, and used four or five napkins a day. She complained of severe dysmenorrhea, backaches and cramps on the day preceding the onset of her menses; this lasted until two days after the flow ceased. Otherwise, she had always been well and strong. When asked to write down the dates of her periods for the preceding six months, her cycles proved to vary in length from twenty-five days to thirty-one days. However, it was decided to compute her ovulation dates on the basis of a twenty-seven to thirty-day cycle, since her last four cycles had come within this range. Assuming ovulation to occur as described earlier in this paper, and accepting Mrs. C.'s statement that her last menstrual period began on May 31, the next ovulation should have occurred between June 11 and June 18. Accordingly, the patient was admitted to the hospital on June 10.

Pelvic examination, which was limited by pain, revealed a normal, nulliparous, marital introitus and vagina. The cervix was normal in size, shape and position, but movement of it was painful. The fundus was moderately enlarged, anteflexed, and tender on motion. The preoperative diagnoses were leiomyoma uteri and sterility.

At noon on June 11, 1937, the potentiometer being stable and, as has been said, calibrated for a deflection of 3 cm. for each millivolt of potential difference, the electrodes were placed as described.

During the first thirty-six hours a fairly constant difference of potential was maintained, so that a definite voltage could be designated as the normal, or basal, voltage existing between the two electrodes. Consequently, any excursion of the beam reflected from the galvanometer in either direction indicated a change in potential between the two electrodes. A slightly disturbing factor in the determination of the zero-line was the frequent occurrence of extremely slow, low-voltage undulations (never exceeding 2 millivolts and seldom reaching this figure), which may have been due to rhythmic uterine contractions. In addition there were occasional sudden potential changes in both directions associated with movements of the patient and possibly caused by them or by a psychogalvanic reflex. These rarely amounted to more than 2 millivolts and never exceeded 3 millivolts.

At the onset of the forty-second hour there began a very definite and relatively large electrical disturbance which closely resembled the electrical sign described as accompanying ovulation in the rabbit. The electrical record is represented in Figure 2. It shows a continuance of the record

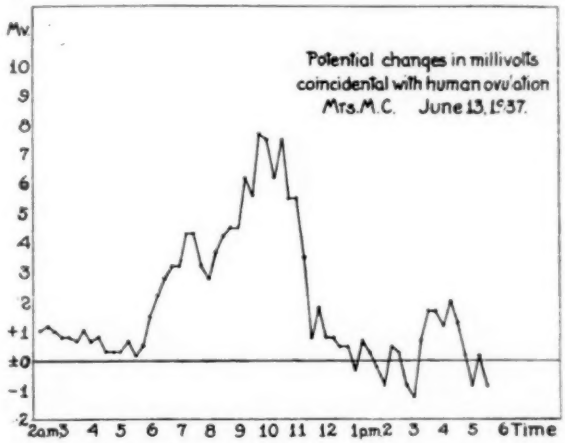

FIG. 2. Graph showing the potential changes, which were recorded every three minutes. For lucidity, intermediate readings which would not alter the curve as shown are omitted.

kept previous to the thirty-eighth hour. Just after the forty-first hour (5:00 a. m., June 13, 1937) the potential difference unmistakably increased until an initial peak of 4.3 millivolts was reached within two hours. The direction of the deflection indicated electrical negativity beneath the vaginal electrode. This rise was immediately followed, during the succeeding hour, by a rather sudden decrease in voltage to 2.8 millivolts. This decrease, however, was only temporary, for the potential difference began immediately to increase until, within

another two hours, it had attained its maximum peak of 7.7 millivolts. This peak voltage, with the exception of one abrupt dip of about 1 millivolt, was sustained for about one hour, after which it took a rapid drop toward the basal level, which was approached within another hour. With the exception of a few fluctuations in the order of from 1 to 2 millivolts above or below the basal voltage which occurred during the six hours following this major decrease in voltage, a fairly constant difference of potential was maintained for the last ten hours before the experiment was ended and the patient prepared for operation.

At laparotomy, the uterus was found to be

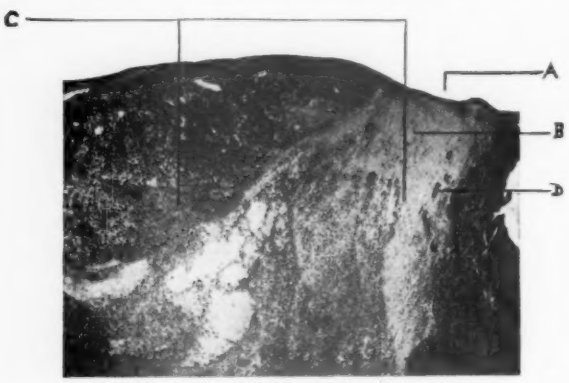

FIG. 3. Rupture in the follicle.
A=Stigma.
B=Coagulum.
C=Portion of wall pictured in Fig. 4.
D=Granulosa cells in coagulum.

greatly deformed by multiple fibroids. There was one pedunculated fibroid, 6 cm. in diameter, arising near the left cornu and prolapsing into the posterior cul-de-sac, and also an intramural fibroid, 6 cm. in diameter, filling the right cornu and displacing the fundus to the left. In addition, there were several subserous and intramural fibroids, not more than 1 cm. in diameter, in the posterior wall. The tubes appeared grossly normal. There were no adhesions. The left ovary contained a new hemorrhagic cyst, 2 cm. in diameter, suggestive of a recently ruptured graafian follicle. The right ovary contained a bluish cyst, about 1 cm. in diameter, and numerous tiny follicles less than 3 mm. in diameter.

The following operations were performed: endometrial biopsy; dilatation and curettage; multiple myomectomy; resection of both ovaries, with removal of cyst and ruptured follicle; saline irrigation of left tube; and an Olshausen suspension.

Pathological examination showed a freshly ruptured follicle, about 1 cm. in diameter, from the left ovary; a detailed description of this follows. In a piece of the right ovary, measuring 1.5 cm. in diameter, there were several small retention cysts, and the larger one mentioned above. There were eight leiomyomas, the two largest measuring 5 and 6 cm. in greatest diameter respectively. The smallest was 15 mm. in diameter. There were some grossly normal curettings. These were unfortunately lost, but a specimen of the endometrium obtained with a suction curette is described below. The washings from the left tube from which, it was hoped, an ovum might have been recovered contained so much blood as to make the search hopeless.

After fixation, the recently ruptured follicle* is a structure 15 by 10 by 8 mm. in size. The point of rupture is 1 mm. in diameter and filled with blood clot. Section through this point (Fig. 3) reveals a cyst lined with a pale yellow, convoluted membrane 1.5 mm. thick, commonly considered to be the granulosa cell layer undergoing luteinization. The cavity of the cyst is filled with blood clot containing variably sized collections of pinkish coagulum which may be either plasma or coagulated follicular fluid.

On microscopic examination, after sectioning and staining, the follicle is seen to be surrounded by ovarian stroma, containing numerous engorged capillaries and a few areas of hemorrhage. Superficially, the follicle is covered with a very thin layer of ovarian cortex which, immediately surrounding the point of rupture, is filled with extravasated blood.

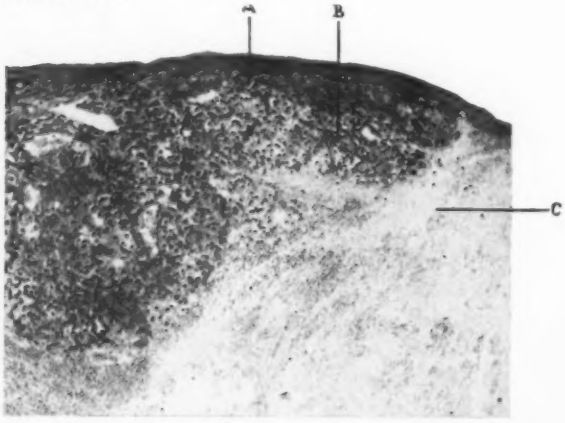

FIG. 4. Portion of wall of follicle beside the point of rupture.
A=Theca externa.
B=Theca interna.
C=Coagulum.

The theca externa (Fig. 4) is a relatively thin layer having the appearance of a fibrous tissue capsule surrounding the whole structure. It contains numerous capillaries, lymphatics and areas of extravasated blood. Its nuclei are a little larger than those of the stroma cells of the ovary. The fibrils and intercellular pink-stained matrix, which in some areas widely separate the nuclei, together with the cells form a distinct layer between the follicle and the ovarian stroma.

*For the description of the ruptured follicle we are indebted to Dr. Paul A. Younge.

The pale yellow lining membrane seen in the gross specimen is composed of a relatively thick layer (10 to 12 cells) of large polyhedral and oval cells (Fig. 5). The nuclei vary from 15 to 20

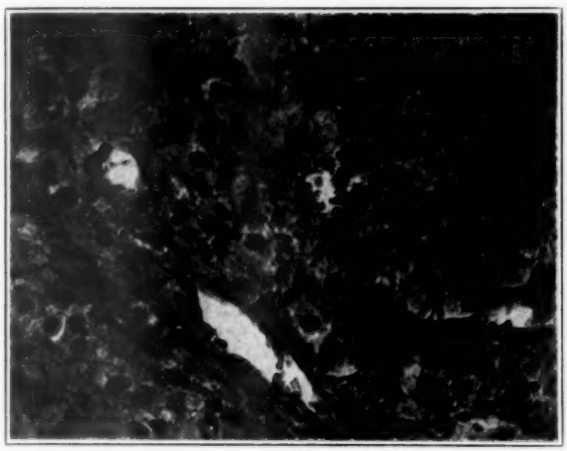

FIG. 5. Cells of the theca interna undergoing luteinization.

microns in diameter and are centrally placed. The abundant cytoplasm appears fairly clear under low-power magnification, but under high-power magnification it contains fine granules. The basal cells have more pink-stained granular material in the cytoplasm, whereas the superficial cells have fewer granules and so appear to have clear cytoplasm. The nucleoli are large, and there is much granular material in the nuclei. The cells give the impression of rapid growth, but only rare mitotic figures are present. The cell membrane is a distinct structure. The cells are either closely packed together or separated by columns of red blood cells and appear to be compressing the central blood clot, in some places actually invad-

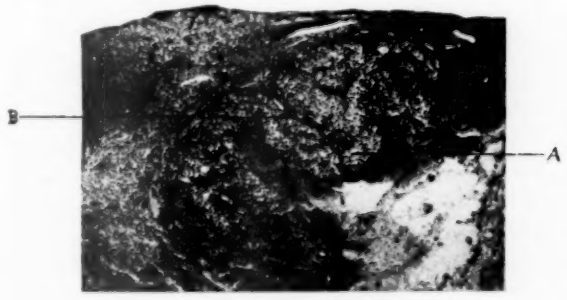

FIG. 6. Wall of ruptured follicle.
A=Convolutions of theca interna.
B=Papillary ingrowths from theca externa.

ing it. The appearance of these cells and their location next to the theca externa establish their identity as the theca interna. This layer is thrown into a convoluted membrane by thick folds or papillary ingrowths (Fig. 6). The central core or supporting structure of these ingrowths is composed of a group of capillaries surrounded by fibrous-tissue-like cells derived from the theca externa. Except in one tiny area, there are no granulosa cells between the theca interna and the clot.

Within the blood clot there is a definite ring of cells (Fig. 7) having the appearance of granulosa

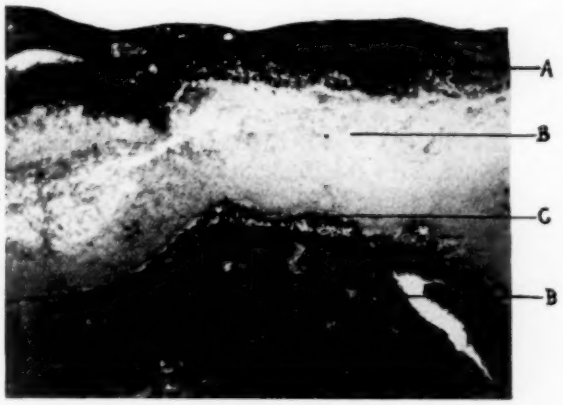

FIG. 7. Portion of ruptured follicle.
A=Theca interna.
B=Coagulum.
C=Isolated ring of granulosa cells.

cells and forming a more or less complete membrane. This appears to be the granulosa layer separated from the theca interna by hemorrhage and exudate. By this process it seems to have been lifted intact and pushed into the cavity of the follicle. At one point this ring of cells is closely in contact with the theca interna, which more accurately suggests its origin. The cytoplasm of the cells (Fig. 8) of this ring is finely granular,

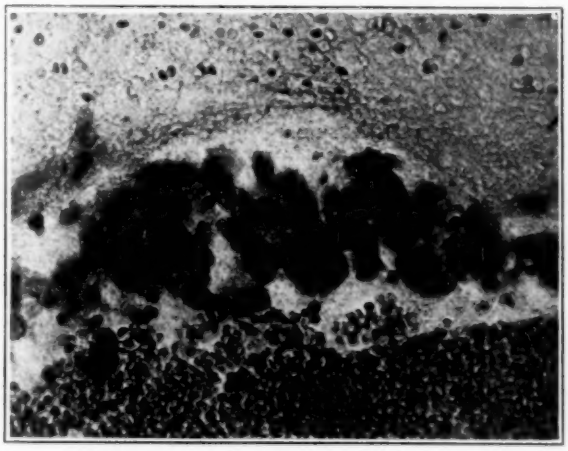

FIG. 8. Granulosa cells — part of separated ring of cells enclosed in the coagulum.

pink staining and vacuolated. Some of the nuclei are pyknotic. A few of these cells are in the blood clot that fills the site of rupture. This finding suggests that the granulosa layer including the cumulus oophorus had been lifted off from the theca interna at the time of ovulation. The

amount of degeneration shown in these cells is consistent with the length of time they have been separated from their normal environment. That they should have been able to multiply and develop into lutein cells in this particular specimen seems improbable.

The frequency with which the granulosa layer of a ripening follicle is observed to be free in the cavity of the follicle in prepared slides more than suggests that it is only very loosely attached to the theca interna. Thus, when the apparently sudden changes, such as hemorrhage into the surrounding tissue and into the follicular cavity, take place during ovulation, it seems quite likely that the granulosa layer is lifted off from the theca interna and then disintegrates. In the human ovary the theca interna during the ripening phase is the most active tissue of the follicle, judging from the number of mitotic figures and the size of the nucleoli. The granulosa layer proliferates and contains frequent mitoses, but just previous to the time of ovulation it appears to be relatively dormant as compared with the activity of the theca interna.

From these observations it would appear that the granulosa cells play no part in the formation of the corpus luteum and that the lutein cells are derived from the theca interna.

Microscopic slides of the endometrial biopsy, made fifteen hours after ovulation, show glands that are generally characteristic of the late proliferative phase. They are rather simple in conformation and not dilated. The epithelium is uniformly pseudostratified. There is an almost complete absence of mitotic figures. In a few glands, however, is seen a definite beginning of central migration of the nuclei with an unmistakable suggestion of a clear zone underlying these nuclei (Fig. 9). The stroma throughout is comparatively dense, and made up of small nuclei with practically no cytoplasm. According to current standards this endometrium, then, shows only the slightest evidence of corpus luteum effect.

SUMMARY

The method of Burr, Hill and Allen for demonstrating the electrical concomitant of ovulation in the rabbit has been adapted to the human being. One such experiment on a thirty-four-year-old white woman is reported. Voltage changes quite similar to those found with ovulation in the rabbit were obtained on the fourteenth day of her cycle and about fourteen days before an expected catamenia.

A description is given of the electrodes used to connect the patient with the potentiometer, and of the appliances by which the electrodes were attached to the patient.

During the forty hours preceding the beginning of ovulation, small changes of the order of 2 millivolts were recorded which may have been caused by uterine activity. Gross movements of the patient, which might have disturbed electrode contact, as well as a psychogalvanic reflex, may have given some of the easily recognized, atypical, short fluctuations.

The typical voltage change associated with ovulation was of the order of 7 or 8 millivolts. During the first two hours, the vagina became increasingly negative to the extent of about 4 millivolts. During the third hour there was a sudden decrease of 1.5 millivolts, and then during the succeeding two hours a gradual increase in potential difference to a maximum of 7.7 millivolts. The voltage difference remained in this vicinity for one hour and then, during the following hour, was quickly diminished, so that the preovulatory potential was again reached about the eighth hour following the initial change. This nearly constant potential was recorded for the next ten hours. Laparotomy, about fourteen hours after the above change was recorded, disclosed a freshly ruptured follicle, which is described. Significantly, the sections show a great activity on the part of the theca interna, as if luteinization had been taking place there, and a comparatively inactive granulosa cell layer, which is sequestered in the middle of the coagulum, where it seems most likely to disintegrate.

In general the endometrium is characteristic of late proliferation, although some glands show unmistakable evidence of such nuclear migration as is commonly considered to be the sign of a very early progesterone influence.

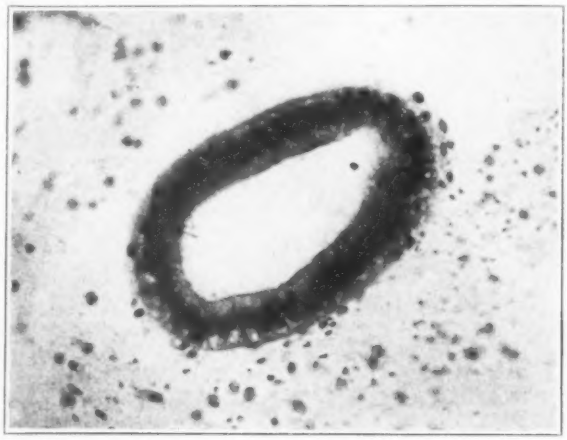

FIG. 9. Isolated endometrial gland showing the beginning of the infranuclear lucid zone.

The authors gratefully record their indebtedness to Dr. Hallowell Davis for his essential assistance in this investigation.

8 Cumberland Avenue.

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NEW HAMPSHIRE MEDICAL SOCIETY

AN ADDRESS DELIVERED AT THE ANNUAL BANQUET OF THE NEW HAMPSHIRE MEDICAL SOCIETY

His Excellency, Francis P. Murphy*

CONCORD, NEW HAMPSHIRE

IT has been the custom for a good many years, I believe, for the governors to come to the annual meeting of the New Hampshire Medical Society, there to enjoy the spirit of good-fellowship that always marks these sessions, and to speak a few words in admiration and commendation of the men and women in whose keeping the health of our citizens rests.

In meditating upon the services rendered by the doctors of medicine, I have been amazed to notice how greatly the scope of your profession has broadened. You have assumed some part of the duties of the attorney, the legislator, the parent, the guardian and the schoolmaster, and the reason for this surprising growth of interest is undoubtedly to be found in the fact that more and more confidence has come to be placed in your advice. For this you and all of us have to thank the extremely high standards which have been attained in medical education, and the wonderful developments that have taken place in the application of medical science.

The story of the technical progress which has taken place in the course of the year that has elapsed since last you met has been discussed tonight by those possessing expert knowledge, and I am sure the year has been a noteworthy one in your profession.

I wish to utilize the short period of time that is available to me in paying deserved tribute to physicians for the character and the extent of their participation in public health services. I believe that the average citizen does not appreciate the fact that, while physicians depend for their livelihood on treating those who are ill, they reduce illness, and hence the source of their income, by public health activities and by constant search for new methods of preventing illness.

Most people forget that physicians who make valuable discoveries in the field of public and private health do not exercise their right to patent them, and in many instances relinquish opportunities for great financial profit for the sake of science.

But the Governor of the State, the State Board of Health and the affiliated and co-operating organizations working in the interests of public health, all realize and appreciate what is being done.

I take this opportunity, publicly, to point out that the physicians of New Hampshire assist in such activities without charge; that, for example, no physician has received any fee or compensation for services, surgical or otherwise, rendered at State Board of Health clinics for crippled children. Furthermore, the physicians of the State give their time freely in connection with State and local boards of health, as members of advisory committees co-operating with public health agencies. They assist the State in its efforts to educate the public in health matters by giving individual advice and by means of public discussions of various problems before mothers' clubs and similar organizations. Many citizens do not realize these things, and hence, unfortunately, are not in a position to appreciate the valuable contribution which medical men make to society. Yet there exists between the government of the State and the physicians an interlocking of interests and a mutual co-operation to promote public health.

The State, for its part, urges the public to consult its physicians regularly, even if not ill, to have early medical attention in illness, and to go to its family physicians for preventive treatment. The State provides free laboratory services to physicians in connection with the diagnosis of tuberculosis, typhoid fever and diphtheria. Blood tests are also made in certain cases without charge by the State, thus not only constituting a convenience to the physician but quite a saving to the patient, since the tests are expensive. Again the State protects the quality and standards of its medical practice by preventing the entrance of those improperly trained. A great and helpful service is rendered by the Division of Maternal and Child Health, which conducts a continuous campaign in favor of medical advice. In all parts of the State, through the medium of the school medical services, the State Board of Education finds physical defects in school children and urges parents to consult the family physician in regard to corrective treatment. And finally, the State supervises water supplies, foodstuffs, milk, and so forth, and establishes the stand-

Held May 19, 1937, at the Hotel Carpenter, Manchester, New Hampshire.

*Governor of New Hampshire.

ards for food and drink, drugs and other material, the use of which is closely related to the public health.

This co-ordination of efforts has been supplemented by joint action on your part with allied professions, so that there is a general mobilization against disease. Under such circumstances it is necessary that there be available to your profession a leadership of a high order, and this I am sure you possess. As a layman I marvel at the skill and the knowledge of modern physicians. There never was a time when your advice commanded greater respect, or your services were more helpful. So much so, in fact, that society confidently expects to derive from your work the benefits of greater and greater improvements in health and the extension of life by a degree exceeding anything ever seriously hoped for in the past.

While the goal thus hopefully set by the result of your surprising progress in recent years may not quite be reached, we have hopes to go far. In this we proceed on the theory that while medical science can hardly be expected to endow us with immortality, it can help us to live out our full lives, and that is a circumstance which I profoundly wish you all may be blessed to experience.

PROGRESS IN THE SURGERY OF THE AUTONOMIC NERVOUS SYSTEM

JAMES C. WHITE, M.D.*

BOSTON

NO startling new developments have been reported during the past year in this field, but anatomic, physiologic and pharmacologic investigations have had a most practical bearing on the treatment of neurogenic disorders of visceral function. This report, therefore, deals to a certain extent with progress made in the fundamental sciences, as well as the advance in the clinical applications of visceral neurosurgery.

ANATOMY AND PHYSIOLOGY

Investigation of the centers of autonomic activity was focused until the last few years upon the hypothalamus. As to the cortical representation of internal organs, Spiegel and Hunsicker[1] have pointed out that such a multitude of excitable areas were described by the earlier investigators that a skeptical attitude on the role of the cortex naturally resulted. It was later assumed that cortical stimulation would elicit only general reflex phenomena upon the part of the vegetative system, as does stimulation of a sensory nerve. Observations reported in last year's review[2] began to demonstrate that various forms of visceral activity can be stimulated from circumscribed centers within or near the motor area. Spiegel and Hunsicker have elaborated this thesis, calling attention to the fact that there is a close topographic relation with the cortical centers of skeletal muscles which are located peripherally adjacent to these organs. For example, salivation has been induced from an area close to the cortical center for facial movement (Bechterew), and bilateral injuries of the area for foot movements may cause a loss of voluntary micturition (Foerster). Furthermore, disturbances of visceral innervation (pupillary changes, sweat gland disturbances and vasomotor phenomena) have been observed in diseases and experiments which injure or stimulate the pyramidal tract within the internal capsule, brain stem or spinal cord.

When the sympathetic nuclei in the hypothalamus are stimulated there is no localization whatever, but a widespread discharge of the entire sympathetic nervous system. This has been demonstrated by Crouch and Elliott,[3] who stimulated many points in this region systematically with the Horsley-Clarke stereotaxic instrument and confirmed the findings of Ranson, Kabat and Magoun mentioned in last year's review.[2] Except for bladder contraction these investigators had been unable to localize any center of parasympathetic activity, but Stavraky[4] has found that stimulation of the ventral and ventrolateral portions of the tuber cinereum causes dilatation of the pial vessels, a lowering of the systemic blood pressure and a slight reduction of the pulse rate.

Important centers for the control of body temperature also lie in the hypothalamus. Frazier, Alpers and Lewy[5] have produced complete loss of temperature control by mesially placed bilateral lesions in the floor of the third ventricle. They conclude that the vital area for temperature regulation lies in the region of the nucleus hypothalamicus anterior in cats and the substantia grisea in

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man. Alpers[6] records 2 cases with suprasellar cysts in which vasomotor collapse and death from hyperthermia followed operative manipulation of this area. From other cases in the literature it seems clear that, in man, lesions in the floor of the diencephalon may produce either hyperthermia or hypothermia, but the reason for these divergent types of response is not known.

In a study of vasomotor reactions in patients after hemiplegia of cerebral origin, Ellis and Weiss[7] noted an increase in blood flow in the paralyzed arm and leg. Edema was noted in the paralyzed hand in 13 of the 16 patients observed. One factor in the formation of such edema appears to be the increase in capillary pressure due to arteriolar dilatation.

While the clinical importance of these observations is obvious, the recent interest in chemical mediation of the nerve impulse might at first thought appear to be of purely academic concern. But this phenomenon is proving to be the explanation of the regaining of vasomotor tone after vascular denervation. The difference between the early complete paralysis of the blood vessels which follows an acute cord injury, spinal anesthesia or sympathectomy, and the subsequent recovery of a considerable degree of vasomotor activity, has been most perplexing. It was pointed out in last year's review[2] that denervated smooth muscle in the arterial walls can still contract under the influence of adrenine, and that after nerve degeneration its sensitivity to this hormone becomes greatly increased. White, Okelberry and Whitelaw[8] have made a special study of this phenomenon in the extremities of animals and human beings, and have shown that whereas the sensitivity of arteriolar muscle to adrenine is only slightly increased if the preganglionic neurones are cut, it becomes two to three times more sensitive after degeneration of the postganglionic neurones. They pointed out that this is the reason for the good results of lumbar ganglionectomy and the poor final result of cervicothoracic ganglionectomy. The former is a preganglionic section, because these upper vasomotor neurones, which emerge over the tenth thoracic to second lumbar spinal nerves, run down through the lumbar chain of ganglia to form synapses around the postganglionic cell bodies in the last lumbar and the upper sacral ganglia. The postganglionic neurones to the sciatic nerve are therefore left intact, but disconnected from the central nervous system. In the case of the arm, however, removal of the inferior cervical and of the first and second thoracic ganglia causes degeneration of the entire postganglionic network to the arm, and renders the smooth muscle in the arteriolar walls extremely sensitive to circulating adrenine. CoTui, Burstein, and Wright[9] have shown that the same response occurs in the smooth muscle of the bronchioles after removal of the stellate and upper thoracic ganglia. This enhanced sensitivity to adrenine may account for the striking improvement which occasionally follows thoracic sympathectomy in asthmatics.

While it has been known for over thirty years that smooth muscle, after degeneration of its sympathetic nerve supply, remains under the control of adrenine, Partington[10] has brought out evidence that the second important sympathomimetic hormone, sympathin, plays a similar role. The continued response to these hormones explains why smooth muscle fails to degenerate after denervation. Other interesting investigations dealing with chemical mediation of nerve impulses have shown that (1) smooth muscle innervated by the parasympathetic system, for example the sphincter of the iris, becomes hypersensitive to acetylcholine after denervation (Shen and Cannon[11]); (2) the postganglionic neurone cell, which also is cholinergic, becomes hypersensitive to acetylcholine after its preganglionic fiber has degenerated (Cannon and Rosenblueth[12]); (3) the increased sensitivity of denervated smooth muscle to hormones, drugs and ions is probably due to an increased permeability of the denervated cells (Rosenblueth and Cannon[13]); (4) nerve transmission to smooth muscle probably takes place entirely by chemical mediation (Rosenblueth and Cannon[13]); and (5) nerve transmission to skeletal muscle is mediated by acetylcholine (Dale, Feldberg and Vogt[14]). Cannon,[15] in his address before the International Physiological Congress in Moscow, in which he gave an excellent review of recent investigations on chemical transmission of nerve impulses, concluded with the prophecy that other mediators exist than those which are known today.

In a recent study of surgical shock, Freeman, Shaw and Snyder[16] stress the reduction in peripheral blood flow which may take place. Over short periods this reaction, which is mediated by the sympathetic nervous system, serves to preserve the organism through diversion of the blood supply to the vital centers. But if it is long continued, reduction of the peripheral circulation results in tissue anoxemia and an increase in capillary permeability. Even in the absence of hemorrhage this intense vasoconstriction secondary to sympathetic hyperactivity may lead to the serious reduction in blood volume found in shock.

A most interesting correlation between physiologic observations made in the laboratory and the fundamental processes of nervous disease has been offered by Cannon.[17] He points out first the profound changes in the incidence of disease that are taking place in this country: whereas serious in-

fections have markedly decreased, conditions involving strain on the nervous system have been greatly augmented. Because the nervous system is all-pervasive, diseases which affect it require consideration of the organism as a whole. After reviewing the outward signs of nervous strain, Cannon points out that deeper than these surface manifestations are the viscera, which the cortex cannot control. There the impulsive emotional level governs; and disturbed processes of digestion, disorderly action of the heart, fluctuating high pressure in the arteries, an accentuated state of diabetes and interferences with menstrual function, all are among the consequences. The antagonism between nervous activity of the impulsive thalamic level and that of the conditioning and inhibitory cortical level must be resolved in the successful treatment of emotional disorders. In turn, a restoration of mental peace may bring a miraculous return of health and happiness.

OPERATIVE METHODS

In a practical application of the hypothesis that preganglionic denervation causes a more complete release of the peripheral blood vessels than destruction of the postganglionic neurones (see above), Smithwick[18] and also Telford[19] have proposed a new type of sympathectomy for vasospastic disorders of the upper extremity. In contrast to resection of the inferior cervical and first and second thoracic ganglia, which contain the cell bodies of the peripheral vasoconstrictor fibers to the arm, the new and more physiologic procedure consists of leaving these undisturbed and cutting the preganglionic fibers which connect them with the anterolateral cell column in the lateral horn of the spinal cord. These preganglionic neurones to the upper extremity leave the thoracic cord from its second to ninth segments. Smithwick's approach is through a resection of the proximal inch of the third rib, with division of the sympathetic trunk below the third thoracic ganglion. This cuts off all central impulses from below T_3. The remaining axones which emerge over the second and third intercostal nerves can be cut off by resecting the central inch of these structures. In doing this it is important to make traction on the nerve and cut it off proximally at a point well within the intervertebral foramen, where it has divided into its motor and sensory roots. Unless this is done, some of the sympathetic connections with the ganglia may be missed, and a complete sympathectomy is not produced. Fortunately the first thoracic nerve, which could not be sacrificed without producing a partial ulnar palsy, contains no sympathetic axones to the arm. After the third intercostal nerve has been cut, the cephalic end of the sympathetic trunk is mobilized and can be swung up and buried in an intercostal muscle. This maneuver results in a wide separation of the two ends of the ganglionated chain across which regeneration has not taken place.

Telford[19] recommends a cervical approach through a supraclavicular incision and a wide freeing up of the dome of the pleura. After division of the scalenus anticus muscle this can be carried down to the third rib and the sympathetic trunk divided at this level. The rami joining the second and third ganglia to the intercostal nerves are divided, and the cephalic stump is buried as high in the neck as possible.

After this new type of sympathectomy only a minimal sensitization to adrenine ensues, and the increase in circulation in the hand remains as satisfactory as in the foot after lumbar ganglionectomy. Furthermore, no Horner's sign is produced, which after a unilateral cervicothoracic ganglionectomy often caused an unsightly droop of the upper eyelid.

EFFECTS OF SYMPATHECTOMY ON THE CIRCULATION

The Carotid Sinus Syndrome

Weiss, Capps, Ferris and Munro[20] have summarized their observations on a large series of patients with an irritable carotid sinus. They report that syncope and related manifestations may result from cardiac slowing through a vagal reflex, from primary depression of the blood pressure or from a central reflex to the brain. Spontaneous attacks can be induced by mechanical stimulation of the sinus region at the bifurcation of the carotid. This reflex mechanism is sensitized by digitalis, and the routine preoperative administration of this drug, particularly in elderly patients, is not without danger. Both the vagal and depressor types of reactions can be controlled by ephedrine and adrenalin. Atropine abolishes the vagal type, but has no effect on the depressor type. The cerebral type, which may be the cause of contralateral convulsions, cannot be benefited by drugs. Denervation of the carotid sinus abolishes the spontaneous and induced attacks in suitable cases. Surgical results are reported in 10 cases subject to the cerebral type of syncope; of these, 8 were completely successful, while in 2 there were late recurrences of atypical attacks which could no longer be induced by pressure over the sinus.

Vasomotor Syndromes

Peet and Kahn[21] have described some extraordinary cases where striking vasomotor changes were produced by abnormalities of central origin. They record a number of instances reported in the literature where gooseflesh, color changes and alterations in surface temperature could be induced

either voluntarily or by emotional stimuli. A young girl who died of a hypothalamic tumor, with a previous history of diabetes insipidus and disturbances in the sleep mechanism, developed Raynaud's syndrome, commencing first in one arm, then disappearing, to recur in the opposite leg, and finally involving both legs. In a boy who suffered a severe head injury a symmetrical cyanosis appeared, extending from the face to the groins anteriorly and over the back and buttocks. Below the cyanosed area, and sharply demarcated from it, the skin was completely blanched. Following a decompression the boy died, and autopsy showed that the brain was swollen, edematous and markedly anemic. There were a contrecoup injury over the right frontal lobe and many small hemorrhages throughout both hemispheres. The authors conclude that the pallor of the skin, which was creeping upward at the time of death, was due to vasoconstriction of central origin. A third example of extreme vasoconstriction of the lower extremities, as well as of the hands, was seen in a patient with a large epidural cyst which extended from the ninth thoracic to the third lumbar segments. After the removal of the cyst the vasomotor changes disappeared. In conjecturing as to why the hands were involved, it is important to recall Langley's demonstration that the vasomotor outflow to the upper extremity leaves the spinal cord as low as the ninth or tenth thoracic segment.

In a study of circulatory changes in the fingers after peripheral nerve lesions, Lewis and Pickering[22] have brought out some points of fundamental importance. Disuse, whether resulting from lesions of the motor nerves, from mechanical fixation or from psychic disturbances, leads to a diminished circulation through the skin of the immobilized part. After loss of sympathetic supply there is some regaining of tone by the vessels of the affected limb, but the skin in general remains warmer. After combined loss of motor and sympathetic supply, as in cases of anterior poliomyelitis subjected to sympathectomy, the affected limb is in general warmer than the unaffected. Section of a mixed peripheral nerve leads first to abnormal warmth, but later to persistent coldness of the denervated skin. The change from warm to cold skin seems to correspond in time with degeneration of the posterior root fibers. This reduction in blood flow is probably effected primarily by a disappearance of the sensory axone reflex, but it may also be due in part to a loss of vasodilator fibers in the posterior root. Lewis and Pickering conclude that nutritional changes in the skin, subcutaneous tissues and bones may all be explained by disuse, defects in blood flow and sensory loss. It is unnecessary to assume any "trophic" influence of the nervous system on these structures.

In the treatment of true Raynaud's disease, sympathectomy is of value because the operation is followed by dilatation of the arteries. It has been pointed out above, however, that complete paralysis of unstriated muscle does not take place as in the case of the striated variety. Smooth muscle does not degenerate, because it still reacts to circulating hormones. In fact, after degeneration of its nerves it reacts to these chemical mediators more intensely than it did before. It also reacts far more intensely after the peripheral postganglionic neurone has degenerated than after destruction of the central preganglionic neurone. Good experimental and clinical evidence now exists that this phenomenon accounts for the following common observation, made among others by Peet and Kahn.[21] After bilateral cervicothoracic and lumbar ganglionectomy in a typical case of Raynaud's disease, they record that "there has never been any trouble with the feet since. Both hands, however, still become cyanosed. Horner's syndrome is present bilaterally and there has never been any sweating in the arm, hand or leg." This last observation proves that the sympathetic nerves to the arm, as well as the leg, have been destroyed, yet in spite of this, color changes still take place in the hands. It has been pointed out above that the cervicothoracic operation causes a complete degeneration of the postganglionic fibers to the arm, with a consequent maximal sensitization of the digital arterioles to adrenine and sympathin. This is true to a much lesser extent after the lumbar operation, which affects only the preganglionic fibers and causes but a slight degree of sensitization. Prolonged observation of the hands of patients with Raynaud's disease treated by the new type of preganglionic sympathectomy devised by Smithwick[18] to meet these physiologic requirements, has shown superior results in all but 4 out of 50 denervations. Both the feeling of warmth in the hands and their appearance have remained as satisfactory as is commonly the case in the feet. Telford,[19] who employs a very similar procedure in England, has reported equally gratifying results. When the fall in skin temperature which follows the injection of adrenalin is measured after this new type of sympathectomy, it is no greater in the hand than in the foot denervated by lumbar ganglionectomy, whereas after the older cervicothoracic operation there was a twofold to threefold greater fall.

Now that reliable operative methods have been devised for ensuring effective and permanent vasodilation in the vasoconstrictive neuroses, it is only necessary to select suitable cases in the early stages of the disease, before endarteritic changes have taken place with thickening of the intima, fibrosis of the media and adventitia, and perivascular infiltration (Ross[23]). These structural changes in

the arteries are associated with digital ulceration, atrophy of the terminal phalanges and scleroderma. Unfavorable cases can be easily eliminated by diagnostic tests which are now in common use.

A number of other conditions resulting from poor circulation have been submitted to sympathectomy. Telford and Simmons[24] described 10 cases of erythrocyanosis, associated with chronic chilblains. This condition consists of a reddish-blue discoloration of the skin, usually in the lower half of the leg. The color blanches on pressure, but returns quickly from all sides with dark blood. The subcutaneous tissues are thickened, and nodules develop which may heal by cicatrization or form indolent ulcers. In this form the condition resembles Bazin's disease. After lumbar ganglionectomy the cases reported were all relieved of their symptoms, and the progressive scarring of the subcutaneous tissue retrogressed. That certain cases of thromboangiitis obliterans with a large superimposed element of vasospasm respond well to sympathectomy has been known for some time. Maddock, Malcolm and Coller[25] in studying the effect of tobacco on this disease have found that the reduction in peripheral blood flow which accompanies smoking is mediated by the vasoconstrictor nerves and disappears after lumbar ganglionectomy.

A new and valuable application of sympathectomy has been reported by Harris and McDonald.[26] They have noted that prolonged increase in the blood supply to the lower extremity of a growing child can result in acceleration of its growth. Children with congenital megacolon have shown an inch of lengthening in the leg after left lumbar ganglionectomy. Harris and McDonald have applied this measure to the stimulation of overgrowth in shortened paralyzed legs after poliomyelitis, and report a striking increase in the length of the limb within the period of their observations. The factors favoring a good result are:

Paralysis limited to one lower extremity.
Early operation, if possible by the age of six years, to ensure a long period of continued growth.
Maintenance of the increased vascularity, which cannot be counted on in cases of extreme paralysis.

Since sympathetic ganglionectomy in patients with rheumatoid arthritis and a poor peripheral circulation was first advocated by Rowntree and Adson in 1927, few reports have corroborated their favorable results. Young,[27] however, records 7 cases with distinctly promising results. He concludes that increasing the circulation may exert a valuable therapeutic influence upon the local joint conditions, and that thereby completely bedridden and crippled patients may be relieved from pain and restored to the possibility of a useful life.

EFFECTS OF SYMPATHECTOMY ON THE BLOOD PRESSURE

A peculiarity of smooth muscle is that denervation does not bring about a permanent loss of tone. As brought out above, this is due in part to its sensitivity to sympathomimetic hormones, a property which is increased as the nerve fibers degenerate; in part also to the fact that the peripheral ganglia develop a rhythmic discharge of their own which is independent of the central nervous system (Govaerts[28]). Other as yet unknown mechanisms may also play a part. These phenomena explain the striking difference between an acute and a chronic denervation. The marked fall in blood pressure which follows high spinal anesthesia is due to the sudden widespread paralysis of the vasoconstrictor mechanism. Bradshaw,[29] as well as Wilson, Roome and Grimson,[30] have found that the hypotension which follows spinal anesthesia or a high spinal cord transection does not occur in the recently sympathectomized animal. In the human being after cervical cord injury there is a return to a normal blood-pressure level when the period of spinal shock passes off.

A great deal of clinical interest in the surgical control of essential hypertension has been evident in the past year. This subject is still in an uncertain state. Experimental evidence offers little hope for the permanent reduction of hypertension. In this connection Heymans and Bouckaert[31] have shown that dogs with hypertension following resection of the cardioaortic and carotid sinus nerves cannot be restored to a normal blood pressure by a combined removal of the abdominal sympathetic chains and both splanchnic nerves. Only total sympathectomy can restore a normal level of blood pressure in these animals.

As Morton[32] has pointed out, the premise for the attack on the sympathetic nervous system is that essential hypertension is due to overactivity of sympathetic vasoconstriction. An argument for splanchnicectomy rests on the supposition that there is an increased constriction of the arterioles in the splanchnic area from effector impulses over these routes. Recent investigations of Prinzmetal and Wilson[33] raise a grave doubt as to the validity of this assumption. If the hypertension were due to increased vascular resistance in the splanchnic area, the blood flow, according to Poiseuille's law, must necessarily be increased through the other vessels of the body, their caliber remaining the same. This Prinzmetal and Wilson have found not to be the case. Furthermore, the vasomotor reactions of the hypertensive are no different from those in the normal subject. It appears that in essential hyperten-

sion a normal vasomotor activity is superimposed on an intrinsic vascular constriction, and that if the reasoning of these investigators is correct, surgical measures should not abolish the underlying increase in arteriolar tone which is responsible for the disease. What factor is responsible for this intrinsic tone is as yet unknown. From evidence presented by Pickering[34] it does not appear to be a circulating pressor substance, although there may be such a substance not detectable by our present methods.

In a medical critique of the value of surgical measures Weiss[35] points out that essential hypertension is primarily a progressive, obstructive disease of the arteriolar system over the entire body, and that the elevation of the arterial pressure is a homeostatic adaptation for the purpose of maintaining optimal blood flow to the tissues. He concludes that even if one effectively lowers the arterial pressure, one certainly cannot claim to influence the progress of the arteriolar constriction in the brain, heart, muscles and other organs. Until several more years have elapsed for the accumulation of follow-up statistics it will be impossible to tell whether the life of these patients can be prolonged.

Case reports after operations by Fralick and Peet,[36] Heuer[37] and Adson and Allen[38] have proved beyond doubt that some of the most disagreeable subjective symptoms of hypertension can usually be relieved. These include headaches and in certain instances disturbances in vision.[36] In carefully selected cases there is a worth-while reduction in blood pressure in about 50 per cent. Unfortunately, no test can predict with any certainty which patient will respond favorably. It is agreed by all writers that the young patient with a large pressor response to cold or emotion and a striking reduction with rest and sedative drugs is most likely to do well. Patients over fifty years old or with impaired cardiac or renal function should not be operated upon.

No agreement has yet been reached on the best way to produce a maximum reduction of vasoconstriction. For this purpose all procedures are designed to reduce vasoconstriction over a maximal area of the body and to eliminate medulliadrenal secretion. Fralick and Peet,[36] who have been the most enthusiastic champions of supradiaphragmatic splanchnicectomy, have reported operations upon 90 patients. Of these 42 have been followed for periods ranging between five and twenty-two months. The operative mortality was 4.8 per cent. Little or no improvement resulted in 38 per cent, but there was definite reduction in the blood pressure in 43 per cent and an "apparent cure" in 14 per cent. Among those apparently cured were patients with marked changes in the ocular fundus. The blood pressure in these has remained normal for many months and there has been a complete restoration of renal function. Seventy-five per cent of the patients had symptoms indicative of cerebral involvement, and 90 per cent of these obtained subjective relief. Heuer,[37] however, feels that his results with this operation in 9 cases have been disappointing. He has therefore cut the anterior spinal nerve roots from the sixth thoracic through the second lumbar segments in 21 patients. One patient died on the operating table, another succumbed to streptococcus meningitis, and a third developed a transverse myelitis. The reduction in blood pressure after this very radical operation does not seem to be any greater than in supradiaphragmatic or infradiaphragmatic resection of the splanchnic nerves. Adson and Allen,[38] who at first advocated anterior rhizotomy, have now shifted to a subdiaphragmatic approach. In this operation Adson divides the splanchnic nerves and resects the first and second lumbar sympathetic ganglia, as well as a portion of the celiac ganglia. It is possible in this way to remove the sympathetic outflow to the lower half of the body, but from what is known from experimental work in animals it is theoretically possible for regeneration of the adrenal nerves to take place. The results of this operation to date (sixteen months) have been substantially the same as those reported by Peet.

From what has been learned about these procedures, it is obvious that severe subjective symptoms can usually be relieved and that a worthwhile reduction in blood pressure takes place in about 50 per cent of the cases. How long this will last and whether it will actually prolong life remains to be seen.

INFLUENCE OF THE SYMPATHETIC NERVOUS SYSTEM ON VISCERAL MOTOR INNERVATION

New evidence that higher centers play an underlying role in disease of the gastrointestinal tract has been presented by Freed.[39] In a study of 28 patients with lesions in the hypothalamus or midbrain he observed 6 with pathologic changes in the stomach or intestine. In 18, symptoms of involvement of the autonomic nervous system were found. The reports, experimental and clinical, by many workers suggest the neurogenic basis of peptic ulcer, and indicate the need for a complete autopsy whenever the opportunity presents.

Further studies have been made on the action of the vagal and sympathetic fibers to the gastrointestinal tract. Although the effects of bilateral vagotomy have not been observed in the human being, Ferguson[40] has studied its effects on the gastric functions of monkeys. Cardiospasm of a persistent type occurred in all cases; there was

evidence of gastric hypotonia and delay in the onward passage of solid food. No changes in gastric acidity were observed, and the authors point out that once the psychic phase of secretion is past and food has entered the stomach, local and hormonal stimuli play the principal part in stimulating secretion of gastric juice. Two out of 10 animals developed gastric and duodenal erosions. Barron, Curtis and Haverfield[41] have studied the effects of bilateral splanchnicectomy on the human gastrointestinal tract. They note hypermotility of the empty stomach, an augmentation in gastric tonus and an increase in the amplitude of contractions. Sealy and Witcher[42] have shown experimentally that this increased motility involves the small bowel as well, since sympathetic denervation of the stomach and small bowel in cats reduces the average time for a barium sulfate suspension to reach the cecum by nearly one half. This evidence would suggest that a combination of splanchnicectomy with resection of the lumbar sympathetic chains may be of greater value in particularly rebellious cases of megacolon than lumbar ganglionectomy alone. In a discussion of the surgical treatment of megacolon, Scott[43] has reported restoration of normal bowel function in young children by spinal anesthesia alone without the need for subsequent sympathectomy.

A number of articles have appeared in the past year which afford a more accurate conception of the physiology of urination. Beattie and Kerr[44] have been able to demarcate hypothalamic centers for the increase of bladder tone in the anterior hypothalamus and inhibitor centers further posteriorly. Evans[45] and Denny-Brown[46] have both emphasized the importance of reflex centers in the sacral cord, as well as of the intrinsic bladder innervation, in the physiology of micturition. There are higher inhibitor centers, to be sure, but the intrinsic plexuses in the bladder wall ensure a reciprocal activity between the fundus and bladder neck. Reflex urination mediated through the lower levels of the spinal cord depends on stretch of the bladder musculature. Both the afferent and efferent arcs of this reflex are carried over the pelvic nerves, and the action potentials have been recorded by Evans with the Matthews oscillograph. No evidence has been discovered that the sympathetic presacral fibers play any role beyond contracting that part of the sphincter which lies just below the bladder neck. It seems reasonable to assume that the contraction of this portion of the sphincter is associated with the muscular act of ejaculation, and that this function alone is paralyzed by resection of the presacral nerve. The immediate effect of pelvic nerve section is a disappearance of all postganglionic impulses to the bladder, but ten days or more after the section some discharge can be detected from the isolated ganglia. Munro[47] has shown that after injuries to the cauda equina or the pelvic nerves such an isolated "autonomous" bladder may exhibit some degree of function. But the type of emptying is usually that of overflow distention, and an effective power to evacuate urine is never regained, as may be the case when the reflex arcs through the sacral cord have not been destroyed.

Following these careful investigations of the physiology of urination, presacral neurectomy can no longer be regarded as a logical operation for the treatment of patients with "cord bladder."

SYMPATHECTOMY FOR VISCERAL PAIN

In a discussion of visceral pain, Scrimger[48] recalls that it was believed until recently that pain impulses do not run through the sympathetic trunks, because it is quite possible to cut, burn or crush the exposed viscera without evoking any sensation. Since the discovery of suitable stimuli to produce visceral pain, that is, distention and anoxemia, much has been learned. It is now known that medullated sensory fibers, indistinguishable from those in the cerebrospinal nerves, are present in the visceral sympathetic trunks. The term "viscerosensory" neurones has been suggested for these by White. They do not form synapses in the sympathetic ganglia, but run in continuity from the sense organs in the viscera to their trophic cells in the posterior root ganglia (Lee[49]). They are therefore identical with the cutaneosensory neurones. Furthermore, Scrimger points out the variation in the sensory threshold of different individuals, and observes that certain people have trained themselves to perceive as pain ingoing stimuli from the viscerosensory nerves which are not usually so perceived. Continuous or recurring pain may increase its actual perception. Intractable pain should be submitted to neurosurgical palliation, not only out of kindness but also for its actual influence on the progress of the disease.

An interesting by-product of cervicothoracic ganglionectomy performed for Raynaud's disease and other circulatory conditions has been the observation of Love and Adson[50] that severe recurrent headaches, which in 18 patients constituted a major secondary complaint, either partially or completely disappeared in 75 per cent. Flothow[51] reports cessation of migraine on the operated side after performing a unilateral cervicothoracic ganglionectomy, although the attacks continued on the opposite side. Harris[52] also believes that migraine and other types of atypical neuralgias of the head may be relieved by sympathectomy. The status of this subject still remains most uncertain, as no evidence

of typical sensory fibers has been found in the upper portion of the cervical sympathetic trunk, but the consensus of numerous reports has been that there is a good chance of obtaining permanent relief by sympathectomy in patients who have a clear-cut termination of their neuralgia after diagnostic novocain block.

The surgical treatment of intractable angina pectoris continues to be a much-debated subject. Enthusiasm for total thyroidectomy is subsiding, while the neurosurgical results are steadily improving. Kerr[53] is the only surgeon who continues to advocate superior cervical ganglionectomy, but the results of this operation in his hands have been encouraging: among 30 patients, complete relief was obtained in 14, and 10 others derived sufficient improvement so that they were able to resume their previous life at a slower tempo. Of the 6 remaining patients, 2 died after the operation and 4 had slight or no improvement. The exact way in which this operation can influence cardiac pain remains unexplained, as no sensory fibers are known to traverse the superior cervical ganglion. It has been suggested that resection of this ganglion may eliminate constrictive crises in the coronary arteries. Experimental evidence that the sympathetic nervous system constricts the coronary arteries was advanced by Leriche, Herrmann and Fontaine in 1931, and has been put forward again by Cox and Robertson.[54] Such a hypothesis is in contradiction to the general homeostatic action of the sympathetic nervous system. Furthermore, the fact that dogs can survive a higher ligation of their coronary arteries after cervicothoracic ganglionectomy does not seem to constitute adequate grounds for this conclusion, because sympathectomy also reduces the pain of coronary occlusion and must therefore diminish the vasopressor reflexes which follow in its wake. The most clear-cut evidence on the course of the vasomotor fibers to the coronary arteries is presented in the experiments of Gollwitzer-Meier and Krüger,[55] who measured alterations in flow through the coronary arteries of dogs directly with the *Thermostromuhr* of Rein during stimulation of the stellate ganglion and the isolated upper thoracic ganglia. These measurements show most conclusively that the sympathetic fibers exert a vasodilator effect and that, following the terminology of Dale, the coronary dilator fibers are "adrenergic."

Leriche and Fontaine,[56] who advocate a resection of the stellate ganglion for angina pectoris, have published their results in 27 cases. They have had no deaths, and report 70 per cent with favorable results: of these, 5 cases have been followed for from five to ten years. When the upper thoracic ganglia as well are destroyed, the results are even better. White[57] has reported consistent relief of angina pectoris in patients following section of the upper five thoracic posterior spinal roots or the upper four thoracic sympathetic ganglia, and 85 per cent of satisfactory results after injection of these ganglia with alcohol. Equally satisfactory results have been reported by Flothow[58] in a series of 20 cases treated by paravertebral alcohol injection. Bland and White[59] have extended this procedure to relatively young people with severe angina pectoris complicating rheumatic heart disease. In 4 such patients the attacks of pain were completely relieved. The severest sufferer, a young woman of twenty-six, was bedridden because of pain on the slightest exertion. Following paravertebral alcohol injection she was able to get about for the first time in six months and now, three years later, is able to do light housework and earn her living as a seamstress.

Intractable pain in the genitourinary tract is another condition which has been treated by sympathectomy. But it is gradually being established that most types of bladder pain are not amenable to presacral neurectomy, as so many fibers which carry sensation from the bladder and posterior urethra run in the pelvic nerves. Fortunately this is not true of the discomfort associated with the severest grades of dysmenorrhea. One hundred and thirty-seven such cases have been reported in articles by Kindel,[60] Black,[61] Cannaday,[62] and Meigs.[63] Of these, approximately 85 per cent were relieved either wholly or to a great extent of their menstrual pain. The last two surgeons performed a presacral neurectomy without any supplementary procedure such as suspension of the uterus. These cases alone can be evaluated accurately, and have yielded 80 per cent satisfactory results. The facts that a few patients are not benefited by this operation, and that in others there remains some residual discomfort, prove that some sensory fibers must have escaped. It is most important to discover why these are occasionally missed. In the case of pain associated with carcinoma of the cervix, presacral neurectomy gives a much greater percentage of unsatisfactory end results. This is to be expected, as the disease soon invades the lumbosacral plexus. Greenhill and Schmitz[64] report that of 40 patients treated in this way only 37 per cent obtained complete relief. Some improvement was noted in another 35 per cent, and failures in the remaining 28 per cent. Through the substitution of intraspinal injections of alcohol by Dogliotti's technic they have increased their successful results to 85 per cent in a second series of 40 patients. In extremely advanced cases of the disease, with pain secondary to higher metastases in the spine and the periaortic plexus of nerves, cordotomy alone can give adequate relief.

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AN INJECTION-SITE ARM CLAMP FOR THE SELF-ADMINISTRATION OF INSULIN

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THE arm-band clamp described below is far more simple to use than the description indicates. The device has been in daily use for over nine months, and has enabled the author to take insulin in either upper arm without assistance.

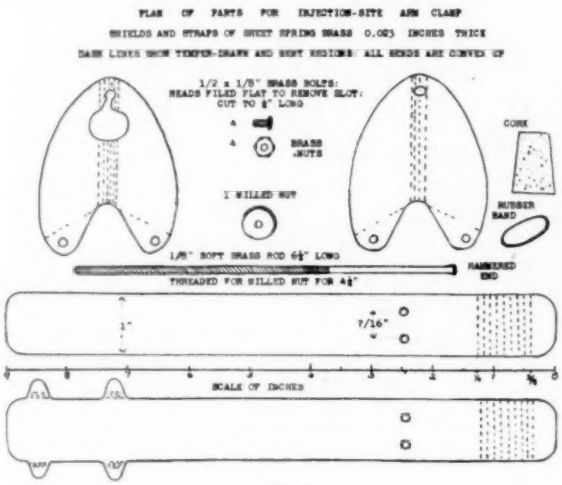
PLAN OF PARTS FOR INJECTION-SITE ARM CLAMP
SHIELDS AND STRAPS OF SHEET SPRING BRASS 0.025 INCHES THICK
DARK LINES SHOW TEMPER-DRAWN AND BENT REGIONS: ALL BENDS ARE CURVED UP
1/2 x 1/8" BRASS BOLTS: HEADS FILED FLAT TO REMOVE SLOT: CUT TO 8" LONG
BRASS NUTS
1" MILLED NUT
CORK
RUBBER BAND
1/8" SOFT BRASS ROD 6½" LONG
HAMMERED END
THREADED FOR MILLED NUT FOR 4½"
1"
7/16"
SCALE OF INCHES

FIG. 1.

The details of construction are shown in Figure 1. The finished parts are nickel-plated and polished. The clamp is assembled in two sections, as shown in Figure 2. A ring-shaped piece of surgeon's tape is applied to the smaller face of the milled nut to prevent premature release of the device. The rubber band is slipped over the strap having the pairs of bent tabs, and between them, making three or four plies of rubber. The sections are then slipped together, the rubber making their position secure. After the threaded rod has been passed through the large hole in the opposite shield, the cork is screwed for a few turns to the end of the rod.

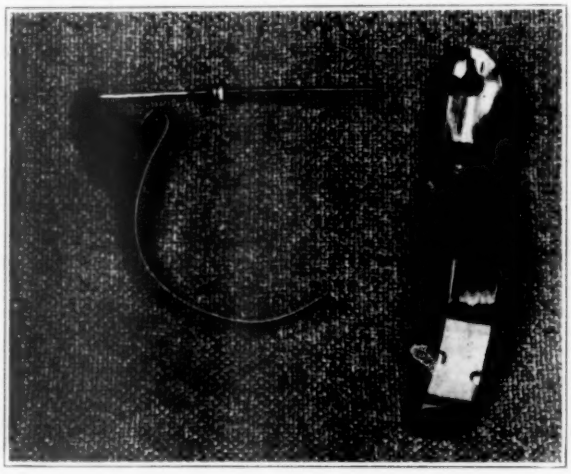

FIG. 2.

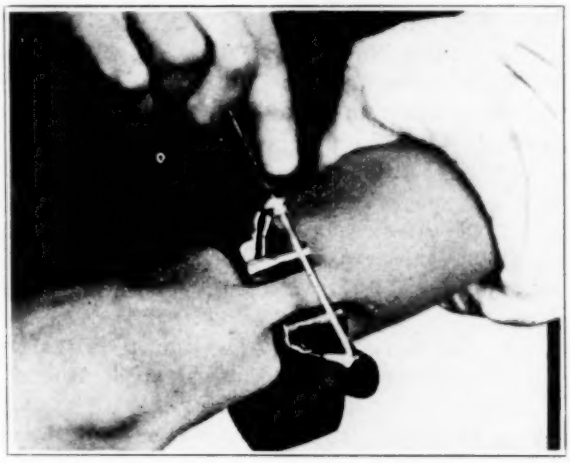

FIG. 3.

When the clamp is to be used, the size of the arm band is adjusted by sliding the sections so that the band will be somewhat larger around than the arm. The site for the injection is rubbed widely with alcohol, so as to moisten slightly the skin where the grasping parts of the clamp are to act. The skin is then pinched up by the device, as shown

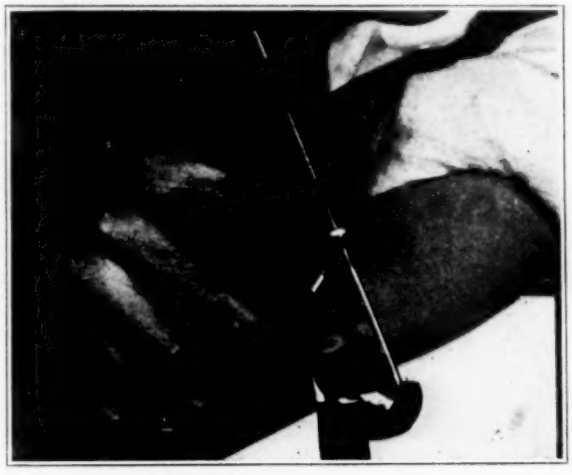

FIG. 4.

Portion of thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Brown University, September, 1937.

in Figure 3. By raising the rod into the slot above the large hole in the shield, through which the milled nut has been pulled, the clamp is held securely in position.

The breadth of the pinched area is adjusted by the milled nut on the threaded rod, and by the expanse of flesh first spanned. After again swabbing the "pinch" with alcohol, the needle is inserted. In some cases where the skin is very soft this process may be facilitated by grasping the raised area nearest the syringe between the tips of the fourth and little fingers of the hand that holds the syringe.

The clamp is next released, as shown in Figure 4, by pressing down lightly on the threaded rod with the thumb of the hand holding the syringe. The clamp springs out of the way, and the insulin is injected. If the device opens too far, so as to let the rod down on the arm, the cork is screwed farther onto the rod. When the needle is retracted, the puncture may start to ooze before the swab of cotton and alcohol can be applied. This difficulty is avoided by removing the needle *almost* completely, merely leaving the tip in place for thirty or forty seconds, and then withdrawing it. This allows time for the application of the swab before oozing occurs, if it occurs at all.

The use of the clamp brings into view portions of the back of the arm which are otherwise out of the line of vision. This increases the injectable areas. Whereas practice is helpful, the device is so simple that the author was successful in using it at the first attempt, with no directions to guide him.

53 Whitmarsh Street.

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTEMORTEM AND POSTMORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT, M.D.

TRACY B. MALLORY, M.D., *Editor*

CASE 23421

PRESENTATION OF CASE

A fifty-nine-year-old American housewife was admitted complaining of marked dyspnea.

For several years the patient had had attacks of precordial pain that radiated down her left arm. These attacks ordinarily followed exertion and were relieved at once by rest. Six weeks before entry she had a similar attack, which, however, did not disappear on rest but continued for several hours. After its subsidence she felt quite ill and weak and called her physician, who told her that she had pneumonia. During the ensuing week her legs and arms became considerably swollen and she coughed a good deal, the sputum frequently being tinged with blood. Four and three weeks prior to entry she had similar attacks of pain, and since that time continued to become progressively weaker and more dyspneic. On the day before entry her abdomen became swollen and distended. The patient's condition was such that a more detailed history could not be obtained.

Physical examination showed a fairly well-developed and nourished woman propped up in bed in considerable discomfort. The respirations were extremely rapid. The skin was cold and clammy, and there was profuse perspiration. The nailbeds and lips were cyanotic. The pupils were widely dilated but reacted to light. There was no engorgement of the neck veins. The heart sounds were very poor, and a rough basal systolic murmur was heard. The left border of cardiac dulness extended 7.5 cm. from the midsternal line. The right border did not project beyond the sternal margin. The blood pressure was 84 systolic, 62 diastolic. The abdomen was enormously distended and tympanitic, but there was very little evidence of fluid. No masses or enlarged viscera were palpable. There was slight peripheral edema, more marked in the left ankle. There was slight dulness at the right base posteriorly up to the angle of the scapula. The breath sounds were diminished in this region, but there were no rales.

The temperature was 101.2°F., the pulse 140. The respirations were 60.

Examination of the urine showed a specific gravity of 1.018, with a slight trace of albumin. The sediment contained an occasional white blood cell and no red blood cells, but many granular casts. The blood showed a white cell count of 50,000.

The patient was treated supportively but showed no improvement and died fourteen hours after entry.

DIFFERENTIAL DIAGNOSIS

DR. MYLES P. BAKER: Let us divide the discussion of this case into two parts, first of the years, and particularly the six weeks prior to entry, and then of the events of the final thirty-six hours. First of all it would seem fair to assume from her story that she had had symptoms due to coronary sclerosis uncomplicated by any contributory factor, such as anemia or thyrotoxicosis. Her pain was definitely exertional pain and was relieved by rest. Six weeks before admission she had a different kind of pain, a more persistent one, which left her weak and increasingly dyspneic — an episode which is consistent with a diagnosis of coronary occlusion. She did poorly in the subsequent six weeks, with repetitions of pain, which, I presume, was similar in character and distribution, four and three weeks prior to admission. We note that she has had not only edema of the legs but that *she has had edema of the arms too;* this is consistent with our conception of a progressive myocardial insufficiency, rather than indicative of a phlebitis in the lower extremities.

The picture, then, up until the day before admission is suggestive of myocardial insufficiency in a severely handicapped heart — the picture of progressive necrosis in the heart muscle without adequate compensation of the coronary circulation or healing of the infarct. I take it that these repetitions of pain on two occasions prior to admission are probably not due to pulmonary emboli, — at least we have no story of frank hemoptysis or pleuritic pain, — and they were said to be no different from the original episode of prolonged pain. Blood-tinged sputum is compatible with congestive failure.

Can the diagnosis of dissecting aneurysm be ruled out? Certainly we do not have the data to discuss that diagnosis very profitably. I remember one case on the wards in Baltimore in 1930, that of a woman whom we believed to have the typical story, physical examination and progress of a patient with myocardial insufficiency following a characteristic coronary occlusion. She had a prolonged hospital stay and was observed by the members of the staff at her home and on subsequent re-entry to the hospital, during which time she was demonstrated to various groups as a case of coronary thrombosis probably with recurrent occlusions

in the same vascular area. She came to autopsy as a result of a chance bronchopneumonia and was found to have a dissecting aneurysm of the aorta. To be sure, she also had been fibrillating and had diffuse myocardial degenerative changes, which complicated the situation. The case was reported by Dr. Hamman in the *Annals of Internal Medicine* three years ago.[1] It would be interesting to review the data on that case to see whether the blood pressure readings were unchanged during and after the attack, and whether the electrocardiograms were typical of acute cor pulmonale. I remember well that the heart sounds were very mediocre.

I think that we need not consider the possibility of intra-abdominal disease as the cause of this woman's pain. Certainly there is nothing to indicate that the events in the final thirty-six hours, manifested by abdominal distention, had origin in a ruptured abdominal viscus or an acute pancreatitis.

The physical examination showed a patient, who was brought into the hospital because of marked abdominal distention and increasing dyspnea, in "medical" shock, acute circulatory collapse, with fever, a notably high white blood-cell count, — a suspiciously round number, but certainly high, — with marked dyspnea and rather surprisingly little evidence of congestive failure. I take it that there was edema of both ankles although it was more marked in the left ankle. There was noteworthy absence of diffuse rales over both lung fields, with only slight dulness and diminished breath sounds at the right base — sounds that might be attributed to high diaphragm in the presence of a markedly distended abdomen.

Did this woman have a hemorrhage? We have no sign of it, unless it is possible that we are dealing with hemopericardium. This was not the characteristically sudden death such as I believe that you have with rupture of the heart. There are cases reported of fairly long survival after rupture of an infarcted area in the myocardium. In the series that I have seen I should say there was some question as to whether the observer could time the exact moment when rupture occurred, and one might say of most of the patients, such as one of Osler's who "walked uphill and lived for thirteen hours after rupture," that actually the original pain may not have marked the time of rupture into the pericardium but simply that of increased weakening of the infarcted area in the heart wall. We note that her death occurred three weeks after her last episode of pain, which is longer than the usual five to fourteen days following a coronary occlusion wherein these ruptures usually take place. I think that rupture of the heart is unlikely.

We come to the differential diagnosis of repeated coronary thrombosis and pulmonary embolus. There are of course many similarities between the picture of shock induced by acute myocardial failure subsequent to a repeated coronary thrombosis and the picture of pulmonary artery block due to embolus. We note a high white count; this is in favor of a terminal pulmonary embolus. Most of the cases of coronary occlusion uncomplicated by pulmonary infection have counts no higher than 25,000. Dr. Libman has reported one instance of a white count of 35,000 in coronary thrombosis, in which there was a hemorrhagic pulmonary infarct consequent on pulmonary embolus. We have no help from the electrocardiogram. I think that the absence of an accentuated pulmonic second sound and of distended veins in the neck does not rule out pulmonary embolus because of the state of shock, in which the return of blood to the right side of the heart is too much diminished to allow congestion of the veins in the neck. I should suspect that, if this woman had had repeated coronary occlusions with marked myocardial insufficiency, we should have more to show for left ventricular failure in the form of bilateral pulmonary rales. I believe that we are dealing with coronary thrombosis and probably the development of a mural thrombus, either one in the right ventricle, as a result of involvement of the interventricular septum, or mural thrombus in the tip of the right auricle in a generally dilated heart, and terminal embolus which was definitely hemorrhagic in type and of the sort that causes a leukocytosis. The abdominal distention is consistent with such a terminal picture, and indeed may be the predominating feature in pulmonary embolus.

Dr. James H. Means: There is something very strange about the history. In the story we are told that this woman had markedly increasing dyspnea, that she was coughing a lot, that she was raising blood-tinged sputum, and that the arms and legs were swollen. From this one would think that she had congestive heart failure. Then when we come to the physical examination it appears that all this edema had disappeared except for slight peripheral edema. There was very little evidence of fluid in the belly, but she had an enormously distended abdomen.

Dr. Tracy B. Mallory: I think that the record minimizes the edema. There was definite edema of both legs, which was distinctly more marked on the left. The edema of the arms had disappeared on entering the hospital.

Dr. Means: Are we right in assuming that

she had true edema — that she was dropsical at one time?

DR. MALLORY: We know that she had edema of the lower extremities, and we have her story of swelling of the arms.

DR. MEANS: I have a feeling that one cannot be certain there was no complication of some sort in the abdomen. The high white count and distention suggest that there might have been interference with the circulation of the bowel. I do not know what kind.

DR. WYMAN RICHARDSON: I think that either mesenteric thrombosis or dissecting aneurysm should be considered.

DR. MEANS: I had both in mind but did not have the nerve to mention them. I completely agree with your reasoning.

CLINICAL DIAGNOSES

Coronary heart disease.
Coronary occlusion.
Congestive failure.

DR. BAKER'S DIAGNOSES

Coronary thrombosis.
Myocardial infarct.
Pulmonary embolus, and infarct.

ANATOMIC DIAGNOSES

Pulmonary emboli, multiple, bilateral.
Pulmonary infarcts.
Thrombosis of the left popliteal vein.
Myocarditis, rheumatic, acute.
Colitis, acute ulcerative.
Torsion of appendix epiploica with infarction.
Cholecystitis, chronic.
Cholelithiasis.
Arteriosclerosis, minimal, coronary and aortic.
Peripheral edema, marked, left leg.

PATHOLOGICAL DISCUSSION

DR. MALLORY: The postmortem examination showed a normal-sized heart with absolutely negative coronaries. There was a final fatal pulmonary embolus, as Dr. Baker has suggested, but all her previous episodes were also pulmonary emboli. We found large emboli of various ages and sizes occluding virtually the whole right pulmonary artery tree. The oldest one completely filled the branch to the right lower lobe, and fresher ones were found in the branches in the upper lobe and in the main artery. There was also a fresh embolus on the left side completely occluding the vessels of the lower lobe. The right lower lobe showed extensive infarction, and was probably the cause of the high white count, although a rather acute patchy colitis with several fresh ulcers may have played a role. The mesenteric vessels were negative. One twisted, infarcted appendix epiploica was found, but I do not believe that could have influenced the general picture significantly.

There was one other complicating factor which turned up only when we examined the heart microscopically. We found all the small vessels of the myocardium surrounded with definite Aschoff bodies, so we must assume she had acute rheumatic myocarditis in spite of negative valves. Therefore, it is probably fair to say that she did have true heart failure based on the myocarditis, but all the episodes of pain were, I think, almost undoubtedly due to pulmonary emboli.

DR. BAKER: May I remark, in retrospect, that there is authority for concluding that fatal pulmonary embolus originating from a thrombus in the right side of the heart is rare — the exception. A phlebitis in an iliac vein, or lower in the leg, is a much more likely origin of a pulmonary embolus of the degree exemplified in this case.[2]

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CASE 23422

PRESENTATION OF CASE

First Admission. A twenty-nine-year-old American Negro, a truck driver, entered complaining of difficulty and pain in moving his bowels.

For about five years the patient had been constipated and was in the habit of taking laxatives. For the two years before entry he took a laxative tea every night to induce a bowel movement the following morning. If this was omitted, he became constipated and had considerable difficulty and pain in passing formed stools. He experienced little discomfort so long as his stools remained liquid. Six weeks before entry he failed to have a bowel movement for a week but was finally able to defecate after taking castor oil. During defecation the patient had marked tenesmus. He had the sensation that his bowels were about to empty, only to have an abrupt halt in the process low down in the rectum with very little feces being expressed. During his illness he had passed moderate amounts of pus and mucus in his stools and had occasionally bled from the rectum. The last episode of bleeding occurred five weeks before entry.

His mother and father were born in the Cape Verde Islands. His wife was living and well. She had had one miscarriage, and had borne four normal children. His family history was otherwise noncontributory. He denied venereal disease but was being given weekly injections of arsphenamine and had had three "injections" into his buttocks.

Seven years before entry the patient had had an abscess in the left inguinal region, which ruptured spontaneously and healed fairly promptly. He denied having any penile lesion at that time.

Physical examination revealed a well-developed, well-nourished colored man in no discomfort. Rectal examination showed a small, nontender, whitish nodule posterior to the anus and also nodular, nontender irregularities to the left of the anus. Inside the rectum, about 7.5 cm. above the anus, there was an annular stricture which admitted only the tip of the examining finger. In the left inguinal region there was an irregular scar. The physical examination was otherwise essentially negative.

The temperature was 98.6°F., the pulse 80. The respirations were 20.

The urine examination was negative. The blood showed a white cell count of 9,950 and a hemoglobin of 65 per cent. The blood Hinton test and the Frei test were positive; the Wassermann test was negative.

On the fourth day the stricture was incised anteriorly and superiorly with the diathermy knife. No bleeding was encountered, and after operation the stricture easily admitted the tip of the finger. The postoperative course was uneventful, and he was discharged on the seventeenth day. At that time there was still some tender induration of the anterior part of the rectum but the lumen appeared to be adequate.

Second Admission (five weeks later). For a month after discharge his bowels moved regularly one or two times a day. The stools were normal in color, shape and consistence. During the week before re-entry he had increasing constipation and had only three bowel movements in that period. The stools were soft, tar-colored and ribbon-shaped. He had considerable tenesmus and some pain during attempts to move his bowels. In the previous two months he had lost 8 lb. in weight.

Physical examination revealed a few moist rales at the apex of the left lung. Just to the left of the posterior commissure of the rectum there was an orifice of a fistula. Inside the rectum, nodular thickening and scarring could be felt, although the stricture itself could no longer be made out.

The temperature was 98°F., the pulse 60. The respirations were 20.

The blood had a white cell count of 8,200 and a hemoglobin of 89 per cent. X-ray of the chest showed an area of calcification in the hilus of the right lung, but the peripheral portions of the lung fields were clear.

On the day following entry the fistula was excised; at the time of operation a proctoscope was easily passed by the stricture and showed normal mucous membrane beyond it. He was discharged on the fourth day.

Third Admission (thirteen months later). He was relatively symptom free for six months, when his difficulty in defecating returned. This was associated with a sense of abdominal distention, gaseous eructations, occasional vomiting of bile-stained fluid, the reappearance of ribbon stools and the occasional passage of blood, mucus and pus by rectum. Eleven months after discharge a barium enema revealed narrowing of the sigmoid and colon at a point considerably above the original site of stricture.

Physical examination revealed bilateral chains of firm to hard, freely movable, marble-sized inguinal lymph nodes. The rectal stricture admitted one finger with difficulty.

The blood Hinton test was positive, and the Wassermann negative.

Proctoscopy was done under anesthesia, and the proctoscope easily passed the stricture. No further lesion was visualized as high as 20 cm. from the anus. He was discharged on the sixth day.

Final Admission (three and a half months later). For the next three months his bowels moved quite regularly and with little difficulty. About once a week he noticed some pus and blood in the stools. During this time he used two bottles of citrate of magnesium per week. Quite abruptly about one week before this entry he became constipated and during the ensuing week passed considerable amounts of blood and pus and only two or three normal stools. He had a considerable amount of rectal pain and vomited occasionally. On rectal examination the stricture just barely admitted the index finger.

The temperature was 99°F., the pulse 80. The respirations were 20.

The urine examination was negative. The blood showed a red cell count of 4,050,000 with a hemoglobin of 60 per cent and a white cell count of 10,450, with 67 per cent polymorphonuclears. The stools showed a 4+ guaiac reaction and contained bright-red flecks of mucus. A blood Hinton test was positive once and negative once. The spinal fluid contained 2 polymorphonuclears and 32 lymphocytes per cu. mm.; the protein was 33 mg. per cent, and the gold-sol 0011000000. The spinal fluid Wassermann was strongly positive.

A barium enema revealed marked narrowing of the rectum as far as the rectosigmoid. At the junction of the descending colon and proximal sigmoid there was a constant narrowing of the colon for a distance of about 2 cm. The lumen at that point was about one-third that of the normal colon. At the center of the filling defect a small ulcer crater was demonstrated. The re-

mainder of the bowel filled normally over to the cecum.

He was given oil enemas and milk of magnesia and soon began having regular bowel movements. On the seventeenth day an operation was performed.

Differential Diagnosis

Dr. Grantley W. Taylor: It is worth while to point out that seven years before entry he had a bubo. He entered at twenty-nine, so that his whole disease began at the age of twenty-two, and for five years he had been constipated, namely, since the age of twenty-four.

All they did at the third admission was to confirm by x-ray examination the presence of narrowing higher in the sigmoid, and proctoscopy showed that the original stricture was apparently behaving itself.

This history and the laboratory findings are entirely typical and consistent with a diagnosis of lymphogranuloma inguinale. The hospital's experience with this condition and a review of the literature were recently very well presented by Dr. Chapman and Dr. Hayden in the *New England Journal of Medicine* (217:45 [July 8] 1937).

This case is that of a young Negro whose first recognized symptom was a bubo in the groin, which discharged, and two years later he had difficulty with bowel movements and had to keep them liquid. He occasionally had pus and blood in his stools, with tenesmus and pain on defecation, and he got into serious difficulties when he became constipated. On one occasion he came in with an anal fistula, and at the time of examination he was found to have various whitish nodules in the perianal region which perhaps resembled condylomas. Local skin manifestations of this condition are seen in a considerable number of instances; they appear to be skin tabs or papules, and may represent the site of fistulas, healing fissures or something of that sort.

At the last admission he was almost completely obstructed, with vomiting, pain and cramps, and they spent two and a half weeks cleaning him out before they thought it was wise to operate. We heard at medical school a lot about syphilis as the cause of rectal stricture. I believe that when such cases are carefully analyzed it will be found that the majority are caused by coincident lymphogranuloma inguinale, a disease which is becoming recognized as common in this region as well as in the tropics, and which occurs in Whites as well as in Negroes, with whom it has previously been most commonly associated.

They raise the question of tuberculosis by finding a few rales, and settle it by finding a chest plate which was negative. You occasionally see rectal lesions associated with tuberculosis, but as a rule only with far-advanced, generalized tuberculosis, with widespread pulmonary involvement as well.

At this conference a few years ago we had an amebic proctitis which was confused with carcinoma of the rectum, and I suppose that one would have to bear it briefly in mind as a possibility, although I am not familiar with it as a cause of stricture.

Ulcerative colitis would possibly be consistent with the blood and pus; but the long-standing chronic constipation, the apparent good health which he enjoyed, except for the local condition, the long-continued course and the proctoscopic examination rule it out.

Neoplasm, either malignant lymphoma or carcinoma, is worth while considering when one is dealing with rectal stricture and pain; but at no time were there any of the other findings consistent with this diagnosis.

The positive Frei test is virtually specific. In the cases reviewed by Chapman and Hayden they found only one false positive and that was in a patient with asthma and allergic sensitivity to a great many types of protein.

The interesting thing in the evolution of the disease is that the first time he had trouble he had a low stricture and later a barium enema showed progression upward. At the last entry he had stricture apparently originating in the descending colon and sigmoid. That is high. It suggests that the disease is progressing upward along the colon. It definitely raised the question of what could be done surgically. He had had division of his stricture low down. He had had stretching with a proctoscope to relieve the lower reaches of this process, and finally he was in trouble with a stricture which could not be reached from below. Also, in spite of treatment of this stricture, an active process persisted, with the formation of blood and pus. Obviously something was still in progress in the colon, where we are not dealing with the healed end-process of the disease. So the question is, What should be done? What could be done? Colostomy has been frequently proposed in these intractable conditions. Whether colostomy itself would serve to relieve the symptoms by diverting the fecal stream is open to question. It certainly is a more reasonable thing to do than more radical procedures. In some places, radical surgery with resection has been carried out, but such an operation seems a little more radical than the condition calls for.

One other point that is perhaps worthy of comment is the possibility of terminal malignant de-

generation with a lesion of such long-standing chronicity as this. We are familiar with the development of malignant degeneration in relation to chronic ulceration of the sigmoid or perhaps of the gastrointestinal tract elsewhere, and chronic ulcerations in connection with this condition might degenerate malignantly, and, if so, more radical surgical measures would be justified. Inasmuch as the pathologist has selected this case, something more extensive than a simple colostomy was probably done. I should imagine that the surgery would be more difficult than the surgery for malignancy because the whole pararectal area has been subjected to years of a chronic inflammatory process which would obliterate the normal landmarks.

X-Ray Interpretation

Dr. George W. Holmes: The description of the films is in the text. I can add very little. I might point out the things that are described. Here is the narrow shadow of the rectum, and here the constricted area at the juncture of the descending colon with the sigmoid. I am not able to point out in any of these films the minute ulceration that is described. Here we have a film taken after evacuation of the bowel, and it shows a very normal mucosal pattern in the upper part which would help to rule out ulcerative colitis. The film of the chest is normal except for this shadow which is a calcified gland.

Clinical Discussion

Dr. E. Parker Hayden: Dr. Taylor has covered the essential points of this complication of lymphogranuloma inguinale. This particular individual is a man whom Dr. Chapman and I have observed for some time. He has had several episodes of rectal difficulties as outlined in the previous admissions, and we had seriously considered the question of colostomy because he seemed to be incapacitated for work. The stricture high up in the descending colon was first suspected at his last admission, and was demonstrated by x-ray. I operated on him with the idea of possibly resecting this stricture and doing nothing to the rectum; but when I saw how normal his cul-de-sac was, and considered that the lower stricture had given a great deal of trouble in the past, it seemed worth while to attempt a radical cure. I therefore resected the entire left colon from above the upper stricture down to and including the rectum by a single-stage abdominoperineal procedure. This is a very radical operation to do for a nonmalignant stricture, yet in no other way can certain patients be completely cured. In a good many individuals the rectum heals spontaneously, and they get along very well with occasional dilatation. Resection is not an operation to be done routinely. In the usual cases with involvement of the rectum alone, the same result can be obtained by simple colostomy and posterior resection of the rectum. A surgeon in Philadelphia who has had a wide experience with this disease told me recently that he and his colleagues have performed colostomies with posterior resection in twenty cases of stricture with no mortality.

The resected specimen was about 50 cm. in length. The rectum was generally narrowed and at the point of maximum stricture measured only 4.5 cm. in circumference. The wall was much thickened and appeared white on section. The mucosa showed generalized ulceration. At the upper end of this rectal lesion the line of demarcation to apparently normal bowel was sharp. The upper stricture was tighter than the lower one, measuring only 3.5 cm. in diameter. This lesion too was sharply demarcated from the normal bowel, and in appearance was essentially like the lower one.

This man is still in the hospital. He had a somewhat stormy course, having difficulty with his colostomy, but at present is handling the localized infection satisfactorily and is getting well.

Preoperative Diagnosis

Lymphogranuloma inguinale.

Dr. Taylor's Diagnosis

Lymphogranuloma inguinale.

Anatomic Diagnosis

Lymphogranuloma inguinale.

Pathological Discussion

Dr. Tracy B. Mallory: This case is the most extensive that we have seen of lymphogranuloma inguinale, since it showed involvement of both the rectum and sigmoid. It was interesting that in the pathologic specimen we were not able to trace any direct connection between the lower lesion and the upper one. How the disease had progressed from one area to the other is not at all clear. On the other hand the histologic characteristics in both areas were similar, and I have no question that the upper lesion is the same process as the rectal one. In lymph nodes the histology of this disease is very characteristic and almost specific. We have been able several times to suggest the diagnosis from examination of a biopsy. My experience with the rectal lesions is that the histologic picture is not nearly so characteristic. One does not get the miliary abscesses surrounded by "epithelioid" cells. About all one finds is a very intensive and severe plasma cell infiltration — plasma cells out of all proportion

to anything I have seen in the rectum in any other condition.

DR. TAYLOR: Did the upper stricture show anything that was diagnostic, or was it like the rectal picture?

DR. MALLORY: It was like the rectal picture.

DR. TAYLOR: One of the cases reported in the series described a lesion in the terminal ileum. Was it consistent with terminal ileitis or with this process?

DR. MALLORY: There are very few inflammatory processes that can be said to have a specific histologic picture. Outside of Aschoff bodies, I am not sure there is another. But you can have overwhelming probabilities one way or another, and I think that the picture in this disease is characteristic and one can ordinarily be quite sure of one's diagnosis. In some of the small lymph nodes in the mesentery in this case we did find a characteristic picture, but not in the sigmoid lesion itself.

A PHYSICIAN: Was there an obvious ulcer?

DR. MALLORY: A shallow ulcer with markedly fibrous granulations underneath.

A PHYSICIAN: Did this patient show tremendous lymphangiectasis?

DR. MALLORY: It was not very evident.

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CONCEPTION IN A WATCH GLASS

THE limiting barrier between what we know and what we do not know — between scientific knowledge and ignorance — regarding the field of reproduction is put under great strain and may give way entirely as a result of a recent discovery. The "brave new world" of Aldous Huxley may be nearer realization. Last year Burr, Hill and Allen[1] showed that ovulation in the rabbit was accompanied by a demonstrable electrical change, and as was prophesied then, the same is now found to be true in human beings. In this issue of the *Journal,* Rock, Reboul and Wiggers tell of a change in electrical potential between two electrodes, one placed on the abdomen and one in the vagina, which is of such duration and extent as to make the moment of ovulation easily determinable. The significance of a series of such observations for the control of human conception is quite apparent. What is the time relation between ovulation and menstruation? Is it so definite and constant as to enable women to know when they are fertile and when infertile from a record of their menstrual dates? There has been much indirect deductive animadversion to these questions. It would seem as if we were now furnished with a direct objective yardstick.

Contemplating this new discovery, one's mind travels much farther. Lewis and Hartman[2] have isolated a fertilized monkey ovum and photographed its early cleavage in vitro. Pincus and Enzmann[3] have started one step earlier with the rabbit, isolating an ovum, fertilizing it in a watch glass, and reimplanting it in a doe other than the one which furnished the egg, and have thus successfully inaugurated pregnancy in an unmated animal. If such an accomplishment with rabbits were to be duplicated in human beings, we should, in the words of "flaming youth," be "going places." The difficulty with human ova has been that those recovered from tubes have regressed beyond the possibility of fertilization in vitro. But by utilizing the electrical sign we may be able to obtain them from the follicle at the peak of their maturity. If the new peritoneoscope[4] can be developed along the lines of the operating cystoscope, laparotomy may even be dispensed with. What a boon for the barren woman with closed tubes! Walton[5] is quoted as saying that it is theoretically possible to separate male-determining from female-determining spermatozoa. Will it be possible to obtain son or daughter, according to specifications, and even deliver them of women who are not their mothers? Truly it seems as if the forge were being warmed, and another link may be welded in the chain by which mankind strives to hold nature under control.

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THE PERENNIAL PARKING PROBLEM

The present concern of our state and municipal authorities and the experts who are endeavoring to find some solution for the traffic situation is to keep open the channels through which this immense and increasing vehicular stream must pass. The life of the city demands an uninterrupted flow of traffic, and adequate lanes must be kept open for the rapid passage of fire apparatus. At the same time human life must be safeguarded, and the rights of pedestrians must be preserved. Under such conditions, any possible right that the individual may have thought he possessed to garage his car on the public way has long since been taken from him. To such a pass has the inventor of the internal combustion engine brought us.

Perplexingly concerned with the whole problem of traffic flow is the obvious fact that once a car has reached its destination it must stop, and frequently the necessary errand of the driver requires that it must remain for a longer or shorter period of time at its destination. The problem of automobile motion cannot be divorced from the problem of automobile parking, and neither can be solved by leaving this modern necessity at home.

The all-day parkers and the persons who require the power of twelve cylinders to purchase a paper of pins deserve little sympathy; they merely increase the difficulties of the individuals whose livelihood and whose obligations require the convenience of motor transportation. In this class the physician on his daily rounds and at his office stands easily at the head. Not only his own livelihood but the pressing needs of the public in times of distress require the availability of his automobile.

The conscientious physician does not ask for special privileges on the highways, and special privileges do not exist. The granting of special legal privileges would, in fact, constitute a dangerous precedent. The knowledge on the part of law enforcement officers that an automobile is operated by a physician may, however, lead with propriety to special courtesies, although not to the point of permitting flagrant violations of the speed laws or of traffic regulations that are designed to promote the safety and the convenience of the public. Moreover, police officers who may wish to extend permissible courtesies should be acquainted with the fact that the green cross has little significance and no standing, whereas the official caduceus of the American Medical Association is a bona fide guarantee that its owner is a member of the national association and the state society.

None of us wish special privileges or exaggerated courtesies in the matters of speed and traffic regulations. The physician in reputable standing, and particularly when engaged in professional activities, should, however, be entitled to special consideration in the matter of parking, so long as such privileges are not abused. The physician, who must use his automobile in his daily rounds of attendance on the sick, is surely entitled to particular courtesy if his car is suitably designated.

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Case History No. 42. Bleeding at Four and a Half Months

Mrs. H., a twenty-nine-year-old American housewife, pregnant about four and a half months, telephoned on August 26, 1937, that she had begun to flow very freely, without pain. She was advised to go to bed. She was not seen until the following morning.

Her family history was negative, and her past history was essentially negative. When very young she had had measles, chickenpox and whooping cough. She had also suffered a mild attack of influenza. There was no history of sore throats or rheumatism. Her appendix was removed in 1934, and the uterus was suspended at the same time. Catamenia began at thirteen; they were often a week late, and lasted for seven days, with no unusual amount of discomfort. Her last period started on April 9; this made the expected date of confinement January 16, 1938. She had had one previous pregnancy, which was normal

A series of selected case histories by members of the section will be published weekly.
Comments and questions by subscribers are solicited and will be discussed by members of the section.

throughout and was terminated by a perineal forceps; the convalescence was normal. The baby was nursed for four months.

Mrs. H. was first seen during this pregnancy on May 19, when the uterus was found to be in anterior position and enlarged consistent with the period of amenorrhea. Her weight at this time was 111 pounds. She was seen on June 9, June 30 and July 21; on the latter date she weighed 113 pounds, her blood pressure was 112 systolic, 60 diastolic, and the urine contained no albumin or sugar. The uterus had enlarged consistent with a three and a half months' pregnancy and was palpable above the symphysis. Because she was away in the country, she was not seen again until the flowing started. There was a five-weeks interval between the last office visit and the onset of the bleeding.

When the patient was seen on August 27 there was very little discharge, and the uterus could not be definitely palpated. No vaginal examination was done because of the vaginal bleeding.

On physical examination she was a well-developed and nourished woman. Her blood pressure was 112 systolic, 60 diastolic. Her heart and lungs were normal. Her breasts showed secretion and enlargement of Montgomery's gland. The extremities were normal. On September 4, the red blood-cell count was 4,002,000 and the hemoglobin 75 per cent.

At the end of a week, during which time there had been a small amount of intermittent flowing, she was sent into the hospital. In the early morning of September 7 she had definite cramps and a small amount of discharge. An examination under an anesthetic seemed advisable, since it was definitely felt that the uterus had shrunk a great deal and that she had a blighted ovum. Examination under an anesthetic revealed a uterus which was anterior in position and not more than three months in size, and inside the cervix the intact ovum was felt. This was removed manually, with no subsequent hemorrhage. The placenta had developed to an age of about three months, but the fetus had not developed beyond six or eight weeks in size.

The pathologist reported: "Complete miscarriage, clinically four months. Embryo less than eight weeks of age. Pathologic ovum (Group VI), consisting of a stunted embryo and an immature placenta with slight hemorrhage beneath chorion. Old and recent hemorrhage in the decidua. Focal necrosis of the decidua. Increased intervillous fibrin with ischemic necrosis. No hydatid degeneration of villi."

Comment. Because of the interval of time which elapsed between the last office visit and the bleeding, it is not known just when the uterus ceased growing. Any patient four and a half to five months pregnant who starts to flow deserves an immediate visit. There is no excuse for not seeing such a patient. The treatment for these cases is rest in bed and complete conservatism if the flowing ceases. When the flowing has entirely ceased, examination establishes the fact that the uterus has ceased to grow and that a blighted ovum is the correct diagnosis. It is advisable to allow the ovum to separate spontaneously rather than to attempt to remove it instrumentally. It is known that occasionally a blighted ovum will remain in situ until the estimated end of pregnancy. Examination after the flowing has ceased should reveal this condition, and the attending physician ought to remove this blighted ovum when the uterus has shrunk so that its removal is not a serious menace. It is much better obstetrics to leave a uterus that has ceased to grow at six or seven months until nature starts to empty the uterus spontaneously than to attempt to remove it surgically. No harm ever comes to the mother who carries about in her uterus a dead baby.

In cases of suspected blighted ovum, the Aschheim-Zondek test is valuable because, if the chorionic tissue is not living, this test is negative.

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MCCAUSLAND, WILLIAM A., 123 Franklin Street, Quincy.
McGill University Faculty of Medicine, 1936.

NATHAN, EDWARD M., 1159 Hancock Street, Quincy.
Tufts College Medical School, 1932.

NORCROSS, JOHN W., 12 Devon Road, Braintree.
Harvard University Medical School, 1935.

SECCARECCIO, JAMES F., Quincy City Hospital, Quincy.
Tufts College Medical School, 1936.

SHANNON, PAUL J., 106 Central Street, Hingham.
Middlesex College of Medicine and Surgery, 1930.

Submitted by Robert L. Cook, *Secretary*.

PLYMOUTH DISTRICT

BARRON, ARTHUR H., 38 Webster Street, Rockland.
Middlesex College of Medicine and Surgery, 1930.

GOLDSTEIN, WALTER, 169 West Elm Street, Brockton.
University of Heidelberg, Germany, 1923.

HARB, ALFRED A., Brockton.
University of Geneva Faculty of Medicine, 1915.

MATHEWS, MOLYNEAUX, 28 Maple Street, Brockton.
Middlesex College of Medicine and Surgery, 1933.

MILLER, ROBERT T., JR., Duxbury.
Johns Hopkins University School of Medicine, 1903.

OCKERT, RAYMOND G., 167 Main Street, North Easton.
Tufts College Medical School, 1935.

POLLEN, DAVID A., 153 North Main Street, Middleboro.
Middlesex College of Medicine and Surgery, 1932.

VINAL, RAYMOND G., Norwell.
Boston University School of Medicine, 1935.

WIESNER, ERNEST E., 1111 Warren Avenue, Brockton.
University of Pennsylvania School of Medicine, 1934.

Submitted by Fred F. Weiner, *Secretary*.

SUFFOLK DISTRICT

CARDULLO, ANTHONY O., 350 Hanover Street, Boston.
Tufts College Medical School, 1933.

DEUTSCH, EMANUEL, Boston City Hospital, Boston.
Tufts College Medical School, 1935.

EPPINGER, EUGENE C., 10 Chestnut Street, Boston.
Harvard University Medical School, 1930.

GALE, SAMUEL, 57 Kimball Road, Chelsea.
Harvard University Medical School, 1933.

GAMBOA, ARMANDO M., 496 Massachusetts Avenue, Boston.
Middlesex College of Medicine and Surgery, 1931.

GOLDBERG, WILLIAM N., 100 Maverick Street, Chelsea.
Tufts College Medical School, 1929.

JENS, RUTH K., 707 Winthrop Avenue, Beachmont.
University of Michigan Medical School, 1935.

LEFKOE, HAROLD, Carney Hospital, Boston.
University of Pennsylvania School of Medicine, 1935.

LEVENSON, EDWARD J., 371 Commonwealth Avenue, Boston.
University of Rochester School of Medicine, 1935.

LEVICK, ALFRED D., Boston City Hospital, Boston.
Jefferson Medical College, 1933.

MOYNIHAN, EDWARD J., Boston Floating Hospital, Boston.
Tufts College Medical School, 1933.

NALCHAJIAN, WILLARD D., Haymarket Relief Station, Boston.
Boston University School of Medicine, 1935.

STRONG, JAMES H., 52 Monmouth Street, East Boston.
Harvard University Medical School, 1892.

VOLK, RALPH, 51 Franklin Avenue, Chelsea.
Tufts College Medical School, 1929.

Submitted by John P. Monks, *Secretary*.

WORCESTER DISTRICT

BECK, JAMES S. P., Memorial Hospital, Worcester.
Rush Medical College of University of Chicago, 1931.

BICKNELL, FRANCIS P., Memorial Hospital, Worcester.
University of Rochester School of Medicine, 1936.

CARR, FRANCIS H., Worcester City Hospital, Worcester.
Tufts College Medical School, 1935.

COCHRANE, WILFRED J., 1 High Street, Westboro.
Queen's University Faculty of Medicine, 1929.

COTTINGTON, FRANCES, Worcester State Hospital, Worcester.
Wayne University College of Medicine, 1937.

CROSS, MERRILL M., Memorial Hospital, Worcester.
University of Vermont College of Medicine, 1937.

DEMARCO, JOSEPH, JR., Worcester State Hospital, Worcester.
George Washington University School of Medicine, 1935.

GAVIGAN, ARTHUR J., Worcester State Hospital, Worcester.
Yale University School of Medicine, 1931.

GOULD, WILLIAM C., 63 Russell Street, Worcester.
Tufts College Medical School, 1935.

GUPTILL, CLIFFORD R., Memorial Hospital, Worcester.
Tufts College Medical School, 1937.

MAHONEY, JOSEPH, 70 Pleasant Street, Worcester.
Kansas City University of Physicians and Surgeons, 1926.

MALMSTEAD, CHESTER W., Memorial Hospital, Worcester.
Tufts College Medical School, 1936.

MCCABE, GEORGE E., Memorial Hospital, Worcester.
Tufts College Medical School, 1936.

O'BOYLE, THOMAS J., 228 Main Street, North Brookfield.
Middlesex College of Medicine and Surgery, 1928.

O'TOOLE, FRANCIS A., 175 Cedar Street, Clinton.
Tufts College Medical School, 1935.

PARE, FRANCIS M., 36 Pleasant Street, Worcester.
Georgetown University School of Medicine, 1931.

PHILIPS, SMITH G., 22 Boynton Street, Worcester.
Harvard University Medical School, 1934.

PIEHLER, EDMUND O., Memorial Hospital, Worcester.
Cornell University Medical College, 1936.

RUSSELL, FRANK H., 107 Lincoln Street, Worcester.
University of Tennessee College of Medicine, 1917.

SKOOG, ALLAN P., Memorial Hospital, Worcester.
Tufts College Medical School, 1937.

SMITH, HAROLD W., Grafton State Hospital, North Grafton.
College of Physicians and Surgeons, Boston, 1916.

TANNENBAUM, ISRAEL, 985 Main Street, Worcester.
Kansas City University of Physicians and Surgeons, 1929.

WALL, CONRAD, Worcester State Hospital, Worcester.
Harvard University Medical School, 1929.

WARREN, JOHN H., South Barre.
Harvard University Medical School, 1935.

WATSON, JAMES, Worcester State Hospital, Worcester.
Northwestern University Medical School, 1925.

Submitted by Erwin C. Miller, *Secretary*.

WORCESTER NORTH DISTRICT

CONNOR, GEORGE F., 133 Tisdale Street, Leominster.
Tufts College Medical School, 1936.

GOLDEN, SAMUEL C., 150 Prichard Street, Fitchburg.
Tufts College Medical School, 1933.

MAINVILLE, ALBERT L., 91 Merriam Avenue, Leominster.
Tufts College Medical School, 1934.

POPOLI, ALPHONSE F., 35 Lancaster Street, Leominster.
Georgetown University School of Medicine, 1935.

SCHECHTMAN, HAROLD I., 520 Main Street, Fitchburg.
Middlesex College of Medicine and Surgery, 1934.

Submitted by Francis M. McMurray, *Secretary*.

CORRESPONDENCE

HOSPITALIZATION OF PATIENTS WITH CHRONIC ARTHRITIS

To the Editor: I am enclosing a notice regarding the study of chronic rheumatism which this Department is planning to make in accordance with the provisions of Chapter 393 of the Acts of 1937.

HENRY D. CHADWICK, M.D.,
Commissioner of Public Health.

Department of Public Health,
State House, Boston.

* * *

NOTICE CONCERNING THE RULES AND REGULATIONS GOVERNING THE HOSPITALIZATION OF PATIENTS WITH CHRONIC RHEUMATISM, AS PROVIDED IN CHAPTER 393, ACTS OF 1937

Under the provisions of the above act, the State Department of Public Health has entered into a contract with the Massachusetts General Hospital for the care of patients suffering from chronic rheumatism. This contract allows for the hospitalization of twenty patients. No person will

be hospitalized for a period exceeding six months. In the selection of cases for treatment, preference will be given to indigent patients. No patient will be admitted for treatment unless he has resided in the Commonwealth for at least two of the preceding three years.

Patients will be accepted for treatment only upon written application of a licensed physician upon special forms which will be provided by the Department of Public Health upon request. Such applications must be submitted to the Department, which will decide as to eligibility for admission.

It is intended that the provisions of this act will make possible not only the treatment of patients with chronic rheumatism but also more detailed studies of the various types of joint diseases. It is further hoped that such provisions will eventually lead to a better understanding of the etiology and treatment of the various arthritides as well as provide data concerning the incidence in the State, and so forth. The gathering of such information should eventually make possible certain definite conclusions concerning the best way to meet the many problems connected with these socially and economically important diseases.

Although the group of workers concerned in this new project are interested in studying all types of rheumatic diseases, they are at the moment particularly desirous of studying and treating the various arthritides of children, early cases of rheumatoid or atrophic arthritis, gonorrheal arthritis, and all cases of joint disease presenting diagnostic problems. It is hoped that physicians will refer as many of the last-mentioned cases as possible.

Upon the discharge of each patient from the hospital he will be referred to the physician who signed the application for admission, and a summary report of the medical findings and treatment given together with suggestions for continuation of treatment will be forwarded.

RECENT DEATHS

WORKMAN — William Hunter Workman, M.D., of Newton, died at his home October 7. He was in his ninety-first year.

Born in Worcester, the son of William and Sarah Paine (Hemenway) Workman, he graduated from Yale University in 1869, receiving his medical degree from Harvard in 1873. After taking postgraduate courses at the Universities of Vienna, Heidelberg and Munich he began practice in Worcester. Ill health caused his retirement in 1889.

During the winters of 1897, 1898 and 1899 he and his wife made pioneer journeys by bicycle in Ceylon, Java and India for the purpose of studying the people and their architecture and art. Two expeditions were made to the northern part of Baltistan in 1902 and 1903, where they were the first to explore and map the Chogo Lungma glacier and its three branches. In 1911, on their seventh Himalayan expedition, they explored the region south of the Baltoro glacier, in which is located the Siachen glacier — the largest, longest and most complicated of Himalayan glaciers.

Dr. Workman's scientific work included investigations regarding physiologic effects of high altitudes; structure of ice and glaciers; nature, classification and mode of development of ice pinnacles; and various other glacier phenomena. With Mrs. Workman he wrote several books on their various exploits.

Dr. Workman was a former secretary and censor of the Worcester District Medical Society and a fellow of the Massachusetts Medical Society. He was a fellow of the Royal Geographical Society; a member of the Alpine Club (English), the American Alpine Club and the Authors' Club, London; and an honorary member of the Société de Geographie d'Alger et de l'Afrique du Nord and other geographical and travel clubs.

A daughter, Rachel, who became Lady McRobert, wife of Sir Alexander McRobert, Bart, K.B., LL.D., K.B.E., of Scotland, survives him.

CHASE — Heman B. Chase, M.D., of Westfield, died October 11. He was in his fifty-seventh year.

A native of Hyannis, he received his medical degree from Harvard in 1908. He served as surgeon in mining camps in Colorado and joined the British army during the World War, transferring to the Harvard Medical School unit when the United States entered the conflict. After the War he spent a year in Peru before joining the staff of the Westfield State Sanatorium, of which he became the assistant superintendent.

Dr. Chase was a fellow of the Massachusetts Medical Society and a member of the American Medical Association.

His widow, a son, and a daughter survive him.

FLOOD — Everett Flood, M.D., died in Friendship, Maine, October 16. He was in his eighty-third year.

A native of Clinton, Maine, Dr. Flood was graduated from Colby College in 1879 and Bowdoin Medical School in 1881. He studied abroad at the University College Hospital in London and the University of Berlin.

For eight years he served as assistant psychiatrist at the Worcester State Hospital and for twenty-three years as superintendent of the Monson State Hospital for Epileptics. In 1921 Dr. Flood retired from active practice.

He was a fellow of the Massachusetts Medical Society and a member of the American Medical Association, the New England Society of Psychiatry and the Rhode Island Medical Society. Dr. Flood was a former president of the Boston Society of Psychiatry and Neurology and a vice-president of the American Academy of Medicine.

His widow, a son, and two sisters survive him.

NOTICES

ANNOUNCEMENTS

Frank S. Broggi, M.D., announces the opening of an office at 141 Franklin Street, Framingham.

Edward C. Vogt, M.D., announces the opening of an office at 1101 Beacon Street, Brookline. Telephone: Aspinwall 3340.

Charles Schlosberg, M.D., announces the opening of his office at 481 Beacon Street, Boston. Telephone: Kenmore 8000.

REMOVALS

Carlisle Reed, M.D., announces the removal of his office to 483 Beacon Street, Boston. Telephone: Kenmore 8000.

James C. Janney, M.D., announces the removal of his office to 41 Bay State Road, Boston. Telephone: Commonwealth 0173.

MISSISSIPPI VALLEY MEDICAL SOCIETY AWARD

The Mississippi Valley Medical Society offers a cash prize of $100.00, a gold medal and a certificate of award for the best unpublished essay on a subject of interest and practical value to the general practitioner of medicine. Entrants must be ethical licensed physicians, residents of the United States and graduates of approved medical schools. The winner will be invited to present his contribution before the next annual meeting of the Mississippi Valley Medical Society (September 28, 29 and 30, 1938), the Society reserving the exclusive right to publish the essay in its official publication — *Radiologic Review and Mississipi Valley Medical Journal*. Contributions shall not exceed 5,000 words, and must be typewritten in English in manuscript form, submitted in quintuplicate, and received not later than May 15, 1938. Further details may be secured from Harold Swanberg, M.D., Secretary, Mississippi Valley Medical Society, 209-224 W. C. U. Building, Quincy, Illinois.

PUBLIC LECTURES AT BETH ISRAEL HOSPITAL

The Beth Israel Hospital, in conjunction with the Women's Auxiliary, offers a series of free public lectures to be given in the hospital auditorium on Sunday afternoons at four o'clock. In this course of lectures on medical subjects the prevention of disease will be emphasized. The doors will be closed at five minutes past the hour. No tickets are required. The dates, subjects and speakers are as follows:

November 7. "The Prevention and Control of Disease." Dr. Charles F. Wilinsky.
November 21. "Diabetes: Its Cause and Treatment." Dr. Elliott P. Joslin.
December 5. "You and Your Doctor." Dr. Harry Linenthal.
December 19. "Appendicitis and Other Abdominal Emergencies." Dr. Charles G. Mixter.
January 9. "High Blood Pressure and Heart Disease." Dr. Herrman L. Blumgart.
January 23. "What to Do About Cancer." Dr. Harry F. Friedman.
February 6. "Mental Health." Dr. Harry C. Solomon.
February 20. "Dangers that Lurk in Cosmetics." Dr. Jacob J. Swartz.
March 6. "What Can Be Done in Arthritis." Dr. Armin Klein.

MASSACHUSETTS MEDICAL BENEVOLENT SOCIETY

There will be an important meeting of the Massachusetts Medical Benevolent Society at 5:15 p. m. on Thursday, October 28, at the Boston Medical Library to act on suggestions made by an interim committee for a revision of the by-laws of the society.

Hilbert F. Day, M.D., *Secretary.*

SUFFOLK DISTRICT MEDICAL SOCIETY

There will be a joint meeting of the Suffolk District Medical Society and the New England Heart Association on Monday, October 25, at 8:15 p. m. at the Boston Medical Library, 8 Fenway.

Dr. Milton C. Winternitz, professor of pathology at Yale University School of Medicine, will speak on "Study on the Pathology of Vascular Diseases."

* * *

There will be a censors' meeting of the Suffolk District Medical Society, Thursday, November 4, at 4:00 p. m., at the Boston Medical Library, 8 Fenway. The purpose of this meeting is to examine candidates for fellowship.

Candidates should make personal application to the secretary and present their medical diplomas at least one week before the examination.

John P. Monks, *Secretary,*
Suffolk District Medical Society.

NEW ENGLAND PHYSICAL THERAPY SOCIETY

The season's first meeting of the New England Physical Therapy Society will be held at the Hotel Kenmore, Boston, on Wednesday, October 27, at 8:00 p. m.

The Council will meet at 6:00 p. m. Dinner will be served in the Empire Room at 6:30.

Program

Round Table Conference

The Use and Methods of Application of the High Frequency Currents

The Proper Use of Vacuum and Nonvacuum Electrodes. Dr. Franklin P. Lowry.

Saturation and Autocondensation. Dr. Hosea W. McAdoo.

Diathermy Including Short Wave and Ultra Short Wave. Dr. DeWitt G. Wilcox.

Desiccation and Electrocoagulation. Dr. William D. McFee.

This meeting has been scheduled for the fourth Wednesday to permit members to attend the Scientific Session of the Academy of Physical Medicine at Philadelphia, October 19, 20 and 21.

All members of the medical profession are cordially invited to attend.

William D. McFee, M.D., *Secretary.*

HAMPDEN DISTRICT MEDICAL SOCIETY

The regular fall meeting of the Hampden District Medical Society will be held in the rooms of the Springfield Academy of Medicine, 20 Maple Street, Springfield, on Tuesday, October 26, at 4:15 p. m.

Dr. Roger I. Lee, of Boston, will present a paper entitled "Coronary Thrombosis; a Clinical Entity That Differs in Practice from Textbook Description." There will be discussion followed by supper at 6:00 p. m. at the expense of the society.

* * *

A censors' meeting for the examination of candidates will be held in the rooms of the Academy of Medicine on Thursday, November 4, at 4:00 p. m. A list of the candidates appears in this issue of the *Journal.*

Hervey L. Smith, *Secretary and Treasurer.*

HARVARD MEDICAL SOCIETY

The next meeting of the Harvard Medical Society will be held in the Peter Bent Brigham Hospital amphitheater (Shattuck Street entrance), Tuesday evening, October 26, at 8:15 p. m.

PROGRAM

Presentation of Cases.

Epilepsy in the Light of Recent Brain-Wave Studies. Dr. William G. Lennox and Dr. Frederic A. Gibbs. Discussion by Dr. Stanley Cobb and Dr. Hallowell Davis.

Medical students and physicians are cordially invited to attend.

Marshall N. Fulton, M.D., *Secretary.*

SOCIETY MEETINGS AND CONFERENCES

Calendar of Boston District for the Week Beginning Monday, October 25

Monday, October 25

*8:15 p. m. New England Heart Association. Boston Medical Library, 8 Fenway, Boston.

Tuesday, October 26

*9 a. m. - 10 a. m. Boston Dispensary. X-Ray Demonstration. Dr. Alice Ettinger.

9:30 a. m. Massachusetts General Hospital. Thoracic Clinic. Ether Dome.

*8:15 p. m. Harvard Medical Society. Peter Bent Brigham Hospital amphitheater (Shattuck Street entrance).

Wednesday, October 27

8 a. m. Massachusetts General Hospital. Grand Rounds. Orthopedic Department.

*9 a. m. - 10 a. m. Boston Dispensary. Hospital Case Presentation. Dr. S. J. Thannhauser.

*12 m. Clinicopathological conference. Children's Hospital Amphitheater.

*8 p. m. New England Physical Therapy Society. Hotel Kenmore, Boston.

Thursday, October 28

8 a. m. Massachusetts General Hospital. Circulatory Clinic Rounds.

*9 a. m. - 10 a. m. Boston Dispensary. Peptic Ulcer. Dr. K. S. Andrews.

11 a. m. Massachusetts General Hospital. Medical Grand Rounds.

12 m. Massachusetts General Hospital. Clinicopathological conference.

5:15 p. m. Massachusetts Medical Benevolent Society. Boston Medical Library, 8 Fenway, Boston.

Friday, October 29

*9 a. m. - 10 a. m. Boston Dispensary. Some Newer Aspects of Diabetes. Dr. Elliott P. Joslin.

10 a. m. Massachusetts General Hospital. Fracture Rounds.

12 m. Massachusetts General Hospital. Clinical meeting of the staff of the Children's Medical Service. Ether Dome.

Saturday, October 30

*9 a. m. - 10 a. m. Boston Dispensary. Hospital Case Presentation. Dr. S. J. Thannhauser.

*10 a. m. - 12 m. Staff rounds at the Peter Bent Brigham Hospital. Conducted by Dr. Henry A. Christian.

*Open to the medical profession.

October 21 — Boston Society of Psychiatry and Neurology, 8:15 p. m. at the Boston Medical Library, 8 Fenway, Boston.

October 25 — New England Heart Association, joint meeting with Suffolk District Medical Society, 8:15 p. m., Boston Medical Library, 8 Fenway, Boston.

October 25-29 — American College of Surgeons. Chicago, Illinois.

October 26 — Harvard Medical Society. Page 685.

October 27 — New England Physical Therapy Society. Page 685.

October 28 — Massachusetts Medical Benevolent Society. Page 685.

November 1-12 — 1937 Graduate Fortnight of the New York Academy of Medicine. Page 1000, issue of June 3.

November 6 — American Board of Obstetrics and Gynecology. Page 153, issue of July 22, and page 609. February 5 — Page 609. June 13 and 14 — Page 153, issue of July 22 and page 609, issue of October 7.

November 7 - March 6 — Public Lectures at Beth Israel Hospital. Page 685.

November 18 — Pentucket Association of Physicians. Hotel Bartlett, 95 Main Street, Haverhill, 8:30 p. m.

April 4-8, 1938 — The American College of Physicians. Page 41, issue of July 1.

District Medical Societies

BRISTOL SOUTH

November 4 — 5 p. m., Fall River.

May 5, 1938 — 5 p. m., New Bedford.

ESSEX NORTH

November 4 — Censors' meeting, 4 p. m. Hotel Bartlett, Haverhill.

FRANKLIN

Meetings will be held at the Franklin County Hospital, Greenfield, at 11 a. m. the second Tuesdays of November, January, March and May.

HAMPDEN

October 26 — Page 685.

November 4 — Censors' meeting. Page 685.

Other meetings will be held on the third Thursdays in January, April and July.

MIDDLESEX EAST

Meetings will be held at the Bear Hill Golf Club, Stoneham, at 12:15 p. m. on November 17, January 12, March 16, and May 11.

MIDDLESEX NORTH

Meetings will be held at the Vesper Country Club, Lowell, on October 27, January 26, and April 27.

NORFOLK DISTRICT

October 26 — Beth Israel Hospital, Boston, at 8:15 p. m.

PLYMOUTH

October 21 — Plymouth County Hospital, South Hanson, 11 a. m.

Other meetings will be held at 11 a. m. on November 18, January 20, March 17, April 21, May 19 and July 21.

SUFFOLK

October 25 — Joint meeting with New England Heart Association. Page 685.

November 4 — Censors' meeting. Page 685.

November 17 — Joint meeting with Boston Orthopedic Society.

January 19 — Joint meeting with Boston Medical Library.

March 15 — Joint meeting with Boston Obstetrical Society.

WORCESTER

At the following meetings, except the annual meeting, dinner will be at 6:15, to be followed by business session and scientific program.

November 10 — Grafton State Hospital, North Grafton.

December 8 — St. Vincent Hospital, Worcester.

January 12 — Worcester City Hospital, Worcester.

February 9 — Worcester State Hospital, Worcester.

March 9 — Memorial Hospital, Worcester.

April 13 — Hahnemann Hospital, Worcester.

May 11 — Afternoon and evening, annual meeting. Place and schedule of program to be announced.

BOOKS RECEIVED FOR REVIEW

An Introduction to the Social Studies: An elementary textbook for professional and preparatory groups. Joseph K. Hart. 203 pp. New York: The Macmillan Company, 1937. $2.00.

Neurology. Roy R. Grinker. Second edition. 999 pp. Springfield and Baltimore: Charles C Thomas, 1937. $8.50.

The Traffic in Health. Charles Solomon. 393 pp. New York: Navarre Publishing Company, Inc., 1937. $2.75.

The Postmortem Examination. Sidney Farber. 201 pp. Springfield and Baltimore: Charles C Thomas, 1937. $3.50.

Shadow on the Land: Syphilis. Thomas Parran. 309 pp. New York: Reynal & Hitchcock, 1937. $2.50.

Protoformotherapy in Treatment and Prevention: Fifteen years of research on new scientific bases of therapeutics. N. E. Ischlondsky. 237 pp. London: Henry Kimpton, 1937. 21s.

The Thinking Body: A study of the balancing forces of dynamic man. Mabel Elsworth Todd. 314 pp. New York and London: Paul B. Hoeber, Inc., 1937. $4.00.

BOOK REVIEW

Obstetric and Gynecologic Nursing. Frederick H. Falls and Jane R. McLaughlin. 492 pp. St. Louis: The C. V. Mosby Company, 1937. $3.00.

It is gratifying to those who believe that obstetrics and gynecology should be studied, taught, and practiced as a combined specialty to find their opinion endorsed by the authors of this excellent textbook for nurses. Adverse criticism of individual details in such a book can always be made, but in the main, this volume presents a consistent, rational and satisfactory didactic survey of the combined field of obstetrics and gynecology from the standpoint of the knowledge which a competent, well-trained nurse should possess. There is a foreword, by Edna S. Newman, and the book is well illustrated with eighty-three original drawings by Charlotte S. Holt.